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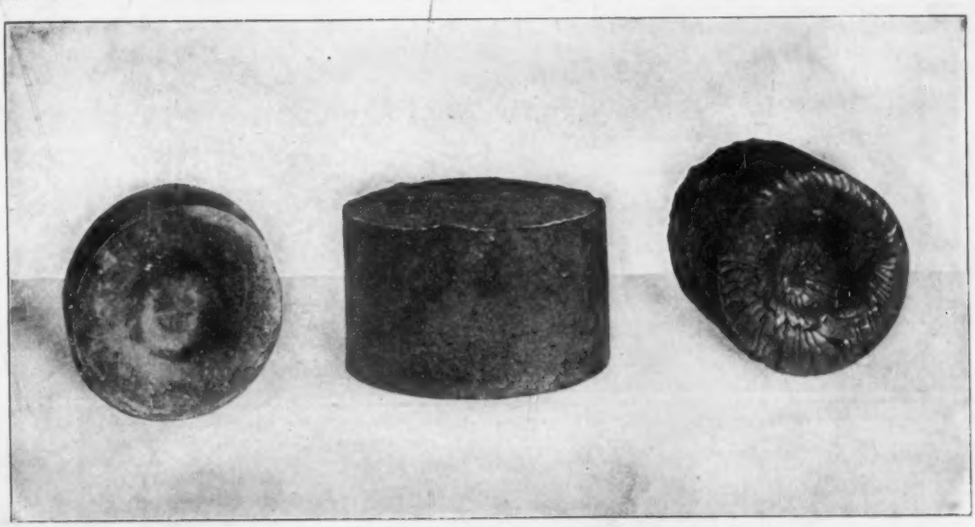

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A NEW CANADIAN METAL WORKS

A PICTORIAL DESCRIPTION OF THE PLANT OF THE DOMINION COPPER PRODUCTS COMPANY AT LACHINE, QUEBEC, CANADA.

BY L. J. KROM.

The thing that most impresses the visitor when he enters the plant of the Dominion Copper Products Company at Lachine, Quebec, is the air of "bigness" that seems to envelop the whole place. The buildings built to house the plant are big, the machines are "big," the men who operate them and produce the product are "big" in body and mind. The product is produced in "big" quantities and the whole proposition of this latest and finest of Canada's metal works is "big," run in a "big" way by "big" men.

HENRY HAGUE VAUGHAN.

The province of the Dominion Copper Products Company is to make copper and brass metal products. The capacity of the mill is or soon will be practically unlimited for metal products of all kinds. At the present time the plant is devoting itself to the production of seamless copper friction rings for explosive shells and of brass discs for cartridge cases. The copper rings are made in six sizes as 9.2 inch, 8 inch, 6 inch, 5 inch, 4½ inch and 3 inch; while the discs are turned out in sizes of 6¼ inches in diameter and ⅜ inch thick.

The mills of the Dominion Copper Products Company were designed, built and put in operation in eight months from the time the ground was broken for the foundations. This remarkable performance was due to the tremendous energy and driving force of Henry H. Vaughan, the vice-president and general manager, and to the loyal and untiring efforts of his engineer, Ferdinand Deming, the well known seamless tube expert.

As this plant was projected less than a year ago at a time when it was practically impossible to get even promises of delivery of the machinery required it fell to the lot of Mr. Vaughan and his co-workers to actually make their own plans, patterns and castings and then finish and assemble their machinery. This procedure was followed out in the case of the most important machines in the plant: the 300, 125 and 75-ton tube drawing machines, the bed plates, pillow blocks, shafting, gearing with roll and pinions, housings and other parts for brass rolling mills. In addition to the above there had to be designed and made the thousand and one things in the way of tools, etc., that are needed to make a modern copper and brass mill complete.

THE PLANT AND ITS PRODUCTS

The plant of the Dominion Copper Products Company consists of a dozen or more separate units, but so well joined together are they that a continuous operation on the metal is carried on from raw material to the finished product. The metal is received from the railroad siding running into the grounds and delivered to the stock room, where also the scrap from the mill is received and classified. The metal is here weighed out and delivered to the casting shop shown in Fig. 1, in steel pans, each pan holding the charge for one crucible. The casting shop contains one hundred crucible furnaces of the pit type designed by the company, fifty on each side as shown in the cut Fig. 1. Here all the brass bars for making the discs are cast and also the copper tubes for the production of the smaller sizes of shell bands from 4½ inches down. From the casting shop the metal goes to the tube mill and brass rolling mill, which are housed in the same building. Here are grouped in convenient places tube drawing machines, rolling mills, muffles, overhauling machines, saws for cutting off ends of tubes, power presses for cutting cartridge discs, pickle tubs and all other machinery and appliances used in turning out the products of the plant. These departments are shown in Figs. 4, 5, 6, 7, 8, 12, 13 and 14. Opening out from the mill proper is the building containing the reverberatory furnace for the refining of scrap copper and the revolving casting machine. Here also is a 1,200 ton press for piercing and converting into tubes the copper billets made direct from the furnace. These tubes are then drawn down further and finished on the tube machines.

In addition to the foregoing departments there is a large building filled with lathes for cutting the copper bands from the seamless tubes and presses for stamping out the cartridge discs from sheet metal. A complete blacksmith shop, machine shop, carpenter shop, inspection room, shipping room, chemical laboratory and a separate building for a reclaiming plant for treating the ashes from the casting shop are included in the plant.

As said above the principal products of this company at present are copper friction bands for large explosive

shells and brass discs for cartridge cases. The copper bands are produced in three ways all of which give a perfect product.

COPPER BANDS FROM SEAMLESS TUBE CASTINGS.

For the smaller sizes of seamless tubes which are cut up to make the 4½ and 3 inch shell bands, the metal is poured into iron cannon molds using a destructible core made of perforated iron pipe known as a core barrel. As this method is the one usually followed in castings seamless tubes it is not necessary to give a complete description* of it here. The amount of tubing made in this way at this Canadian plant is only a small part of the output. These seamless tubes are then drawn down on the smaller hydraulic tube drawing machines shown in Figs. 12 and 13 and which are known as the 125 and 75 ton machines. The tubes are finished on these machines and are then cut up into the bands on lathes.

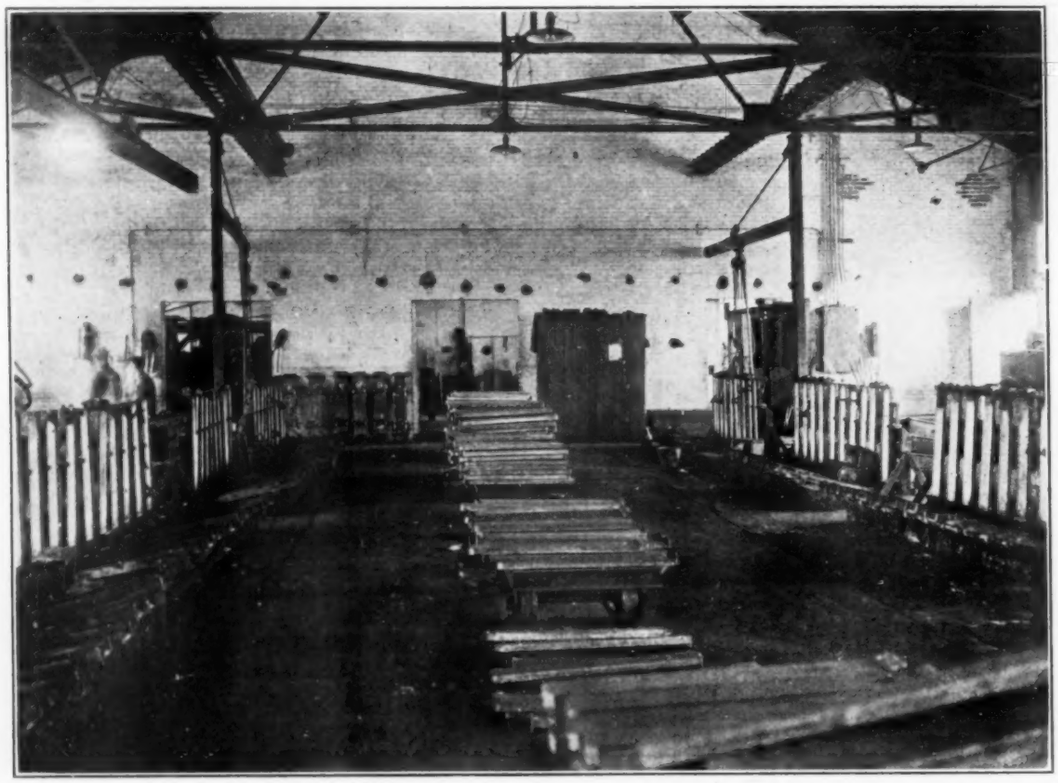


FIG. 1. THE CASTING SHOP OF THE DOMINION COPPER PRODUCTS CO. AT LACHINE, QUEBEC. NOTE THE AMPLE SPACE BETWEEN THE MOLD PITS AFFORDING PLENTY OF ROOM TO WORK IN.

COPPER BANDS BY THE CUPPING PROCESS.

By far the largest production of copper bands are made at this plant by the "cupping up" process. A full description of the manufacture of seamless tubes by this method was given in THE METAL INDUSTRY for February,

*Published in THE METAL INDUSTRY, August, 1913.

FIG. 2. A GLIMPSE OF THE "INDIAN" FORCE AT WORK AT THE DOMINION COPPER PRODUCTS COMPANY PLANT.

FIG. 3. UTONTA ROWKOWA (TOM JOHNSON), AN IROQUOIS INDIAN BRASS CASTER, AT WORK.

1914, so I will only give a brief outline of it here. The material is received by the mill in the form of large octagonal shaped sheets an inch thick, which have been hot rolled in a copper mill. These shapes are shown in Fig. 9. A hole 1½ inch in diameter having been punched in the center of the disc they are put on a circling machine and a perfect circle is cut out, in this case about 48 inches in diameter and which weighs over 400 pounds. The hole in the center of the disc fits the centering pin on the end of the punch of the tube drawing machine thus bringing the disc central with the die. By referring to Fig. 10 the reader can see the large machine used for this purpose and which is known as the 300-ton machine. All three machines shown in the pictures were designed and built by Engineer Ferdinand Deming from his own ideas and have been completely successful from the time of their installation last March.

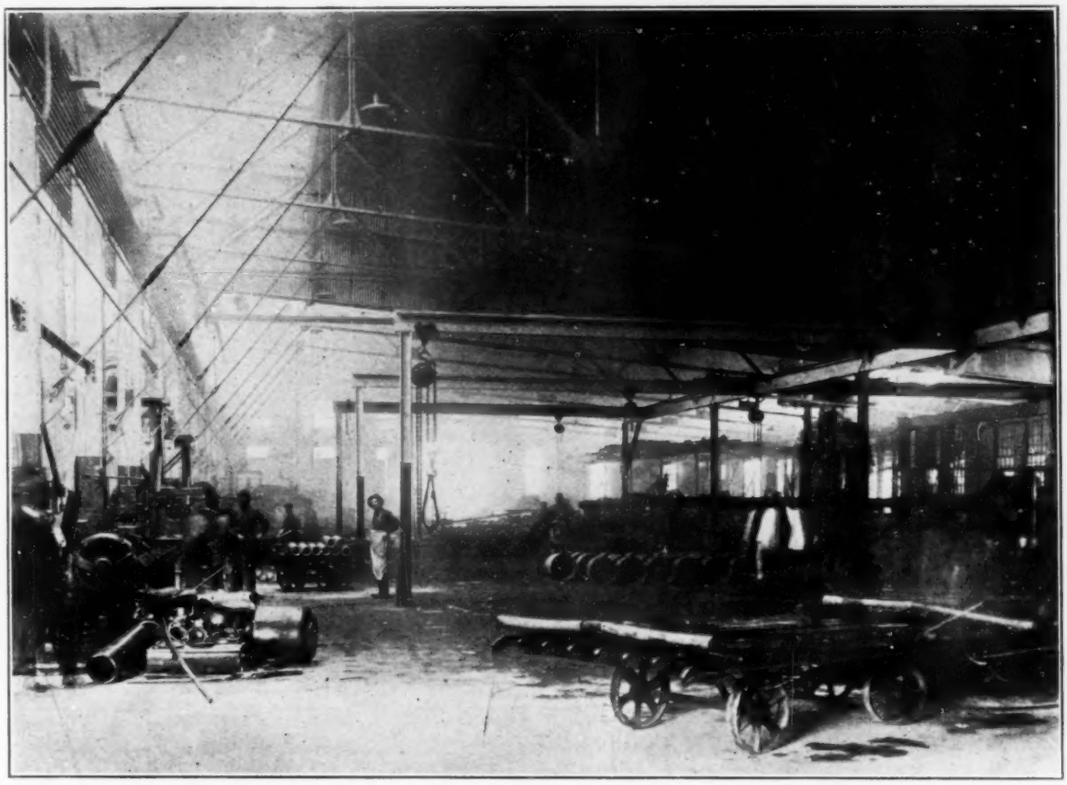


FIG. 4. A VIEW OF THE ROLLING AND TUBE MILL S OF THE DOMINION COPPER PRODUCTS COMPANY AT LACHINE, QUEBEC. THE LARGE CUPS SEEN AT THE RIGHT ARE "SECOND DRAW" SEAMLESS COPPER TUBES.

The circle of copper after annealing and pickling is placed between the die and the punch and rigidly held in position against the die by a hydraulic blank holder. The punch then forces the blank through the die, making a large cup. Some of these cups, after the second draw or

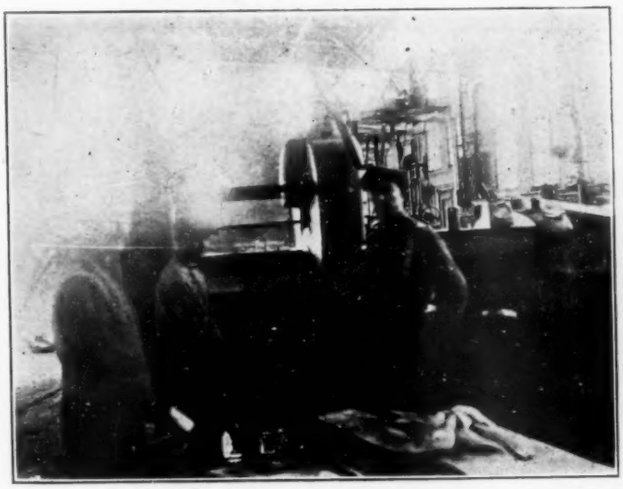


FIG. 5. SAKSARIE KANEWATIRON (FRANK DEERFOOT), AN IROQUOIS BRASS ROLLER, "ON THE JOB."

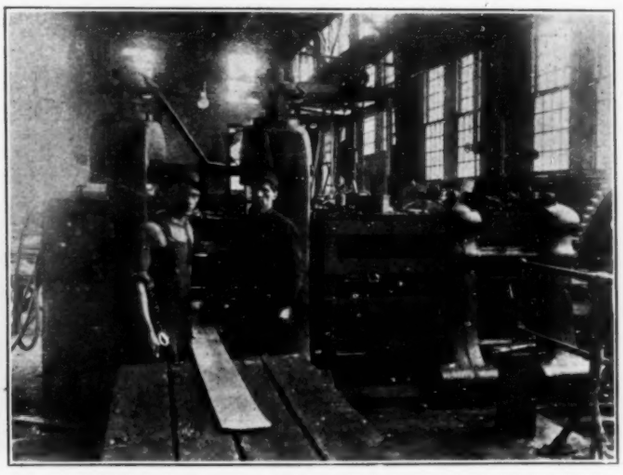


FIG. 6. A PAIR OF 20-INCH ROLLS, RUNNING 25 TURNS PER MINUTE, ROLLING A BAR OF 70-30 DISC METAL.

operation, are seen in our picture Fig. 4. The metal is thus drawn down by a succession of draws, being annealed between each draw. The reduction at each draw is quite large and the cup becomes finally a tube closed at one end but weighing exactly the same as the original circle. The rounded end of the tube is then cut off on a circular saw running 700 revolutions per minute and the tube is then ready for the lathe to be cut up into rings or shell bands. A pile of these finished large tubes is seen in Fig. 11. An idea of the rate of reduction may be gathered from the list of draws given to a circle 48 inches in diameter. These draws with annealing and pickling in between are as follows: 29 inches in diameter in the first draw, then the list runs 24, 20, 16, 12, 9.2 and 8 inches. All these sizes are made on the 300 ton machines while those of 6 inches and down are run on the two smaller machines. A record of the marvelous production of this machine includes the following: 63 draws per hour, this means that the metal was put through the machine at a rate of

FIG. 7. INDIANS RUNNING THE METAL "SCALPING" MACHINES. BIG BOSS SWEETON (415 LBS.) IN THE FAR DISTANCE.

FIG. 8. ANOTHER VIEW OF THE INDIAN "SCALPERS." BOSS CASTER WM. MORGAN AT THE FAR RIGHT.

FIG. 9. COPPER DISCS AS THEY ARE RECEIVED AT THE PLANT OF THE DOMINION COPPER PRODUCTS COMPANY AT LACHINE, QUEBEC. ENGINEER FERDINAND DEMING IS AT THE RIGHT AND TAMENIK OTRETOKEN (DOMINICK McCOMBER), AN IROQUOIS INDIAN, YARD BOSS, IN THE MIDDLE.

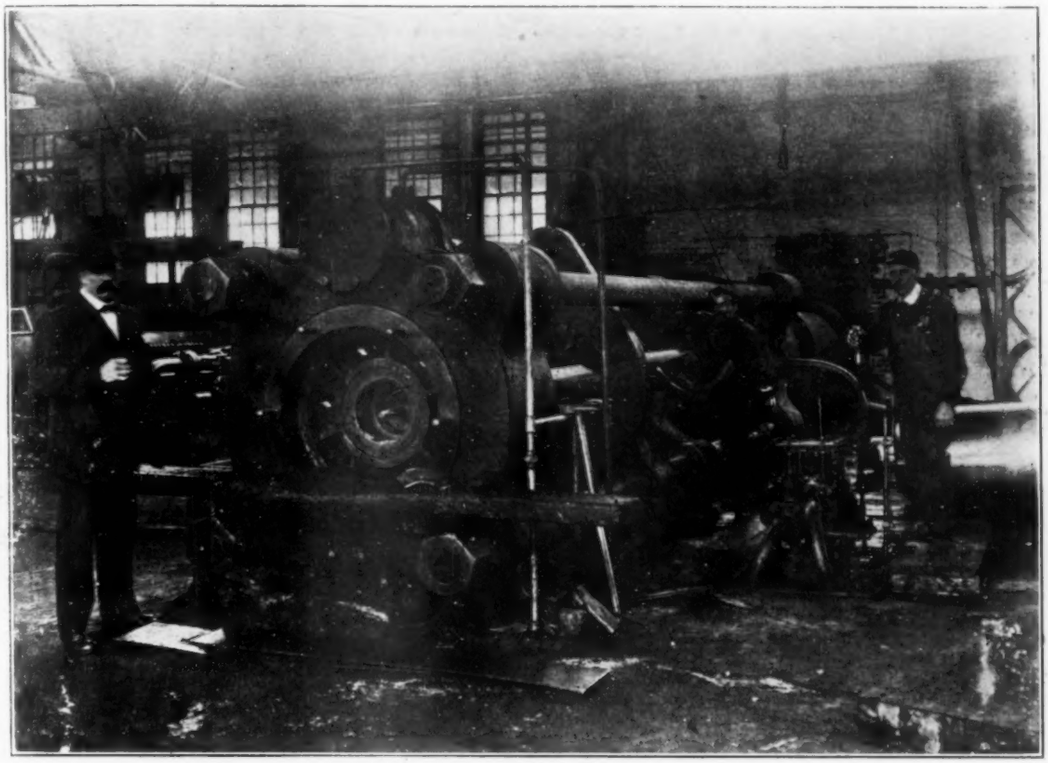


FIG. 10. THE 300 TON HYDRAULIC TUBE MACHINE, WITH SUPT. T. W. PEARCE AT THE LEFT. BUILT BY FERDINAND DEMING AT THE PLANT OF THE DOMINION COPPER PRODUCTS COMPANY, LACHINE, QUEBEC, CANADA.

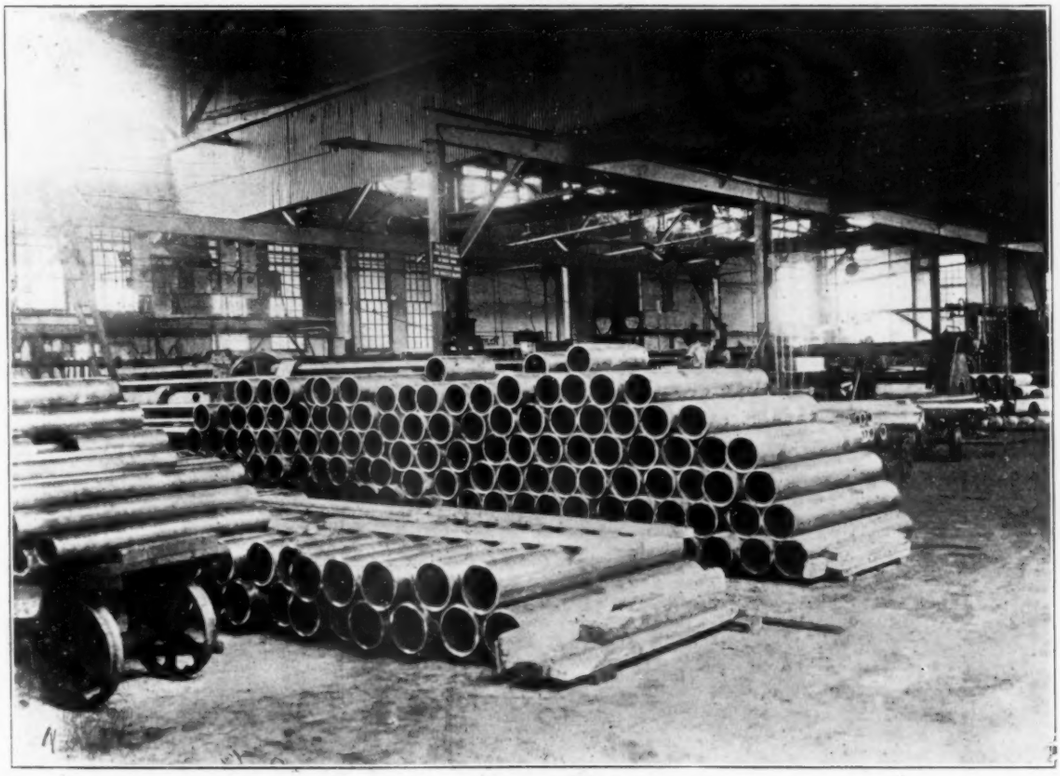


FIG. 11. A LOT OF SEAMLESS COPPER TUBES MADE ON THE MACHINE SHOWN IN FIG. 10. THESE TUBES ARE NOW READY TO BE CUT INTO 9.2 INCH COPPER FRICTION BANDS. EACH TUBE WEIGHS NEARLY 400 POUNDS.

better than one per minute. Another record run was 553 tubes run through in 6 days which meant 7 draws through the machine or 3,871 operations on the machine in a week.

TAKING CARE OF SCRAP.

The third method followed for making these shell bands at this mill involves the use of the reverberatory refining furnace and revolving casting machine shown in Fig. 14. Here all the scrap copper from the plant and elsewhere as may be necessary is melted down and refined by the regular poling process. It is then run out into iron molds having rounded bottoms thus giving a billet of copper round on one end. This billet is put under a 5,000-ton press and a punch forces out the center, making a tube with a rounded end. This tube is then drawn down to the required size on one of the hydraulic machines and the end finally cut off, leaving a seamless tube.

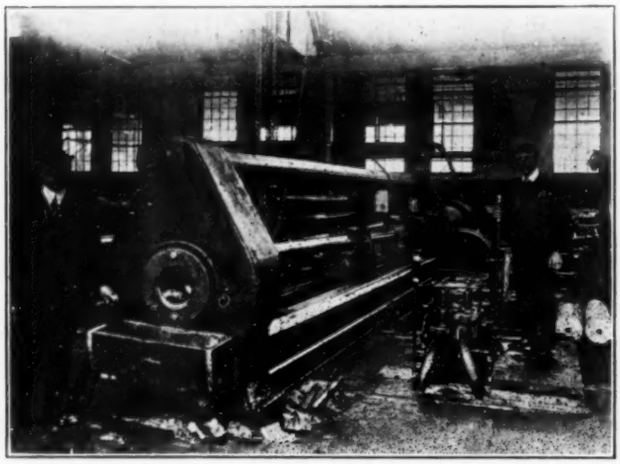


FIG. 12. THE 125 TON TUBE DRAWING MACHINE BUILT BY FERDINAND DEMING FOR THE DOMINION COPPER PRODUCTS COMPANY. ALL TUBES 6 INCHES AND UNDER ARE DRAWN HERE.

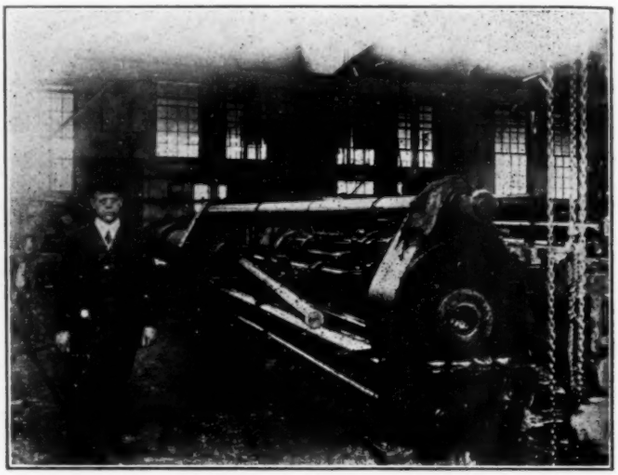


FIG. 13. THE 75 TON TUBE DRAWING MACHINE, ALSO BUILT BY MR. DEMING. NOTE THE HINGED MANDREL. ARTHUR LOCKSHIRE, IN CHARGE, IS THE MAN IN EVIDENCE IN BOTH PICTURES.

THE BRASS DISCS.

The method pursued in making the brass discs at this mill is the same as is found in the mills in the United States and therefore needs but scant explanation. The brass is mixed 70 per cent. copper and 30 per cent.

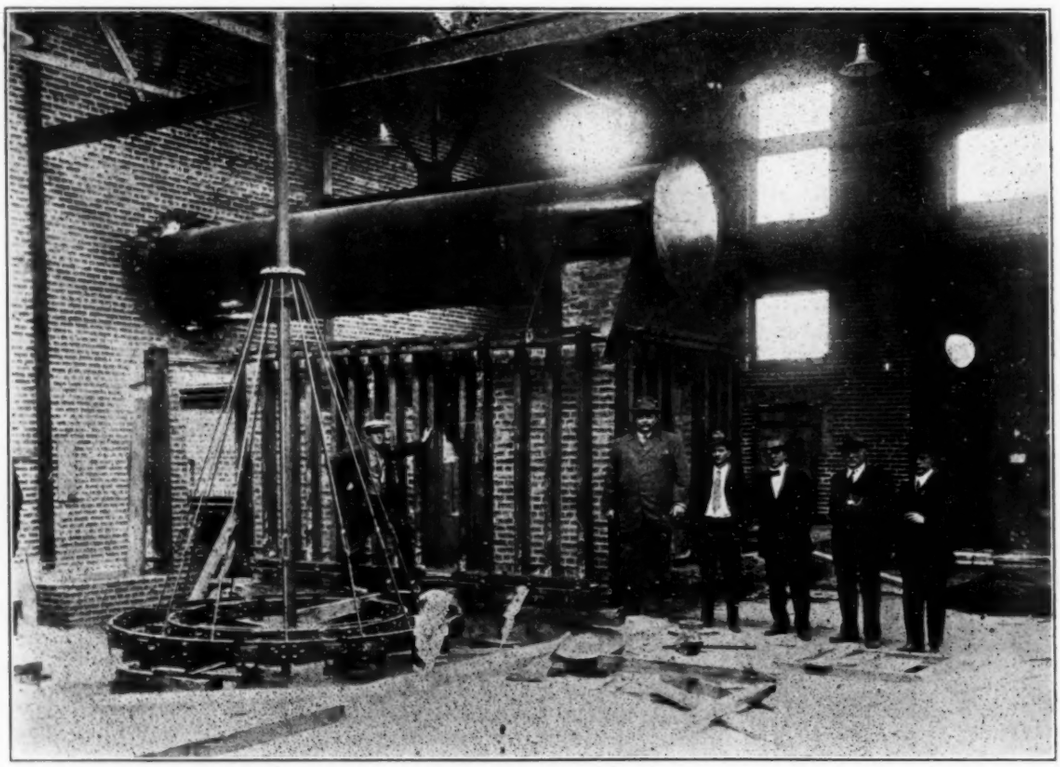


FIG. 14. THE COPPER REFINING FURNACE AND THE REVOLVING CASTING MACHINE. BIG JOE SWEETON IS THE MAN NEXT TO THE FURNACE.

spelter, in graphite crucibles and poured into iron molds making a slab 6¾ inches wide, about 4 feet long and 1½ inches thick. The molds in which these slabs are poured deserve special mention. The molds are hinged at the bottom so that the cover never comes away from the back. The cover is held tight against the back by means of bands held by clamps, no wedges being used. The strainers or runner boxes are hinged to the backs so that they are always there ready for use.

After the brass slabs are poured they are taken from the molds and the "gate" or shrink head is cut off and the resulting bar of good metal is sent to the mill and "broken" down on the breaking down rolls 22 inches in diameter and turning 16 turns per minute. These rolls are shown in Fig. 5. After the first rolling the metal is annealed and then overhauled on the machines shown in Figs. 7 and 8. Here it loses from 4 to 8 per cent. of its weight and is then ready for the subsequent rolling operations which are done on the rolls shown in Fig. 6, and which are 20 inches in diameter and which revolve 25 turns per minute. After being rolled to the proper gauge here the metal is annealed, pickled and the discs are then cut out on power presses.

INDIANS IN OPERATING FORCE.

One of the most interesting features of the Dominion Copper Products Company is the manner in which the labor problem has been solved by Mr. Vaughan and his subordinates. There are six hundred hands employed at these works and 10 per cent. of them are Iroquois Indians from the Iroquois reservation of Cauguwaga, just across the St. Lawrence River from Lachine.

It seems strange for the visitor from the States to see Indian casters, rollers, and bosses of gangs but this is just what this company has. In Fig. 3 is to be seen Utonta Rowkowa (Tom Johnson) a caster, in Fig. 5 is shown Saksarie Kanewatiron (Frank Deerfoot) a roller, while in Fig. 9 the middle man is Tamenik Otretoken (Dominick McComber) yard boss. In Figs. 7 and 8 are shown six overhauling machines, each manned by an Indian, while Fig. 2 shows a collection of Indian helpers such as firemen and moldmen all drawing large pay. When we stop to consider the matter we are not surprised to find the Indian capable of occupying these important positions. As Oghema Niagara, Chief Thunderwater of the Tuscarora nation, who is at the head of the six nation federation, interested in the uplifting of the Indian, says: "The Indian was born to lead, from a child up he sought to outdo his fellows." So here we have a good example of what the Indian can do when given a chance. Of what the white men think of the Indians as brass workers I can quote Big Joe Sweeton, to be seen in the distance in Fig. 7 (he weighs 415 pounds and stands 6 feet, 4 inches high) who is in charge of the overhauling machines. "Give me an Indian any day. I can make an overhauler of him in two days, while it takes three weeks to do the same with another nationality." William Morgan, superintendent of the casting shop, seen in his shirt sleeves in Fig. 8, says practically the same thing. As will be seen from a glance at Fig. 2 the company is also well supplied with men from all over the world, as some of the names gathered at random show: Walter Kozloski, Russian caster; Alexander Hadach, Polish caster, while some firemen and moldmen are Mike Moros and Phillip Proderick, Russians, and John Nowak, a Pole. Mr. Morgan said that four months ago none of these men had even seen a casting shop, while now they are doing expert work and from what I saw I believe he spoke the truth. A visit to this plant is certainly worth while, and as said before, the observer is impressed with the possibilities of the plant for taking care of Canada's metal business when the need for war material has passed. The organization is already running so smoothly that it is only a question of duplicating the manufacturing units to make the Dominion Copper Products Company a formidable competitor for domestic business.

THE EXECUTIVE FORCE.

The executive force of the company consists of G. H. Duggan, president; H. H. Vaughan, vice-president and general-manager, who is also president of the Montreal Munitions Company; F. W. Evans, secretary and treasurer; consulting engineer, Ferdinand Deming; general superintendent, G. L. Willard; assistant superintendents, A. C. Steer and H. W. R. Malley. T. W. Pearce, in charge of the 300-ton tube machine, shown in Fig. 10; Arthur Lockshire, in charge of the two smaller tube machines, shown in Figs. 12 and 13. Thomas West, chemist and metallurgist, with Frank Gardner, assistant. William Morgan is superintendent of casting shop, and Joseph Sweeton is in charge of the overhauling machines.

NEW PROCESS OF SILVERING MIRRORS

The old method of coating mirrors by the mercury process is a long, tedious and unwholesome operation which has been nearly universally replaced by silvering. The latter method is, however, by no means perfect; the very thin film deposited by reduction of a solution of nitrate of silver is neither as white nor as brilliant as that of tin amalgam; it is deficient in strength, being detached by the slightest friction, and tarnished on exposure to sulphurous fumes. These faults are only very imperfectly overcome by a backing of varnish, of itself often a source of deterioration. Long ago an electrolytic deposit had been considered as a substitute, but experiments in this field yielded only mediocre results, whose irregularity was mainly due to the extreme thinness of the silver coating. Indeed, in the electrolytic method, it is this metallic film which constitutes the cathode, whose very minute cross-section is a poor conductor. When the contact is made around the periphery of the silvered glass, the electrolytic deposit takes place almost entirely in its immediate vicinity, and at points remote from the edges the thickness of the deposit diminishes rapidly, so that at the centre there is scarcely any deposit.

This drawback has been cleverly overcome by Delere, Gresy and Pascalis, whose method is in actual use in Paris by the Compagnie des Glaces de Saint-Gobain. This process, styled "Silvered protector" (French patent No. 444,710), consists in multiplying the number of current-carrying points of contact on the silver cathode by means of flexibly supported metallic combs. These combs have brass teeth, to each of which is attached a globule of tin, a soft metal which avoids scratching the silvering. All parts of the electrode immersed in the electrolyte are covered with an insulating layer of paraffin, with the exception of the points in contact with the silvering. The anodes consist of bands of pure copper supported between the contact points. The mirror to be coated is laid, silvered side up, in a shallow tray containing the electrolyte, the latter being kept of uniform strength by forced circulation. During the plating the current is interrupted every few minutes and the contact points shifted a short distance. The electrolytic action is thus uniformly distributed over the entire surface, resulting in a very homogeneous deposit of copper. Mirrors so protected resist the action of sulphurous fumes under the most unfavorable conditions and possess the unexpected advantage of increased reflecting power.—**The Metal Industry,** London, England.

NECESSITY THE MOTHER OF INVENTION IN PLATING OPERATIONS

A Description of a Novel Method for Brass Plating Ribbon Zinc.

Written for The Metal Industry by Charles H. Proctor.

That the old saying that "necessity is the mother of invention" has been aptly proven during the past two years, no one with a thinking mind can doubt. The great European war has changed many conditions on account of the elimination of the source of supply, therefore, many substitutions have been made which under normal conditions would not have been thought of or even considered while satisfactory results were being obtained under normal conditions.

A few years ago, when all the nations of the earth were upon friendly terms, when social and business intercourse was uninterrupted and all nations communed with each other, these conditions at present existing in Europe were never dreamed of; it was even impossible to realize that such a war could ever develop and exist in these modern days of the twentieth century. America has felt the elimination of the source of supplies very poignantly for some time. A very maelstrom existed at first, but slowly from this maelstrom necessity came forth and America became equal to the occasion and the great commercial industries continued to expand, because she had adopted "necessity" as the "mother" of her needs.

It is my intention in this article to show how necessity overcame an economic condition and saved thousands of dollars in the manufacture of an article the intrinsic value of which was small, but the artistic value of which has been developed so that today the firm in question, has produced a product superior to that made by France, where this product was originally produced and which nation, previous to the past two years, had practically exclusive control of this industry. During the recent convention of the American Electro Platers' Society in Cleveland, Ohio, there was displayed a splendid line of metal labels in hundreds of shapes and forms. These labels were splendidly decorated in various colored tints and tones and there was a work of art in every label. Such labels lend distinction to products to which they are applied and can be seen almost everywhere, but most noticeably upon perfume bottles and toilet preparations. The use of these artistic labels has no end, so the demand almost exceeds the supply at the present time and there is no doubt but what this line of produce will develop into an immense business.

The abnormal conditions in prices of materials affected the production in this trade as in many others.

PURE ZINC. EXAMPLES OF FANCY LABELS MADE FROM BRASS PLATED ZINC RIBBON. BRASS PLATED ZINC.

As the price of the high grade metal, which was approximately 90 per cent. copper and 10 per cent. zinc, from which these labels were manufactured, increased to such an amount that it was found that to continue to manufacture them would prove a financial loss, so "necessity" demanded a substitute that would prove equally satisfactory for the purpose. Finally, zinc was decided upon, but how to produce a finish equal to a metal consisting of 90 per cent. copper and 10 per cent. zinc was the problem to solve. The metal used in manufacturing these labels was from 1¼ to 2 inches wide and probably .0003 of an inch in thickness, or, in other words, as thin as tissue paper. The plating of the zinc presented a difficult proposition but I will tell here how it was accomplished by mechanical methods.

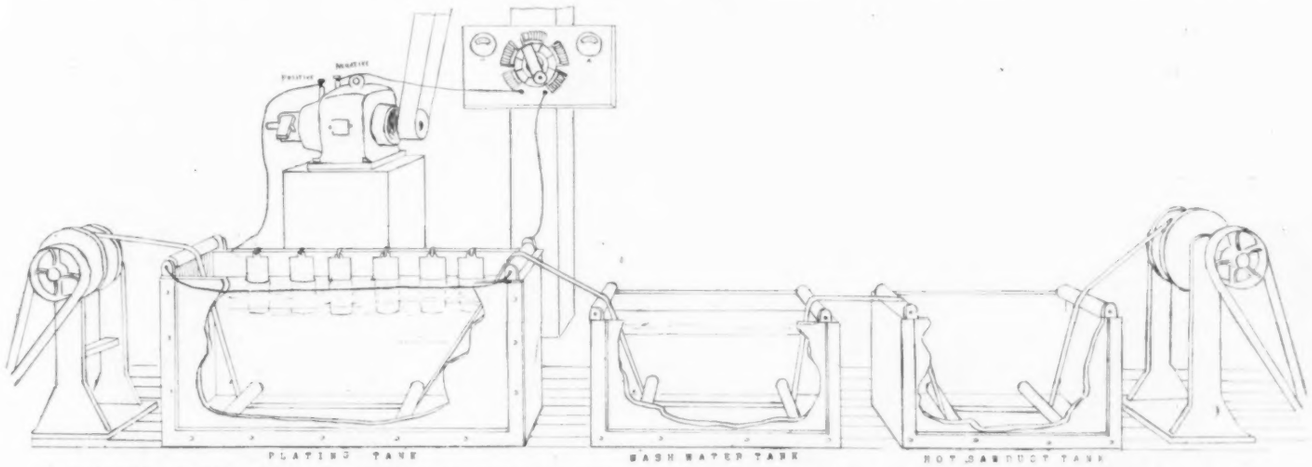
An iron tank 8 feet long, 8 inches wide and 12 inches deep was procured. The electrical connections were made as usual, but in this instance the negative connection was made to both ends of the tank to the roller

contacts over which the metal passed in entering and leaving the tank. The idea was to confine the current entirely to the metal while passing through the solution. The anode connection was made in the usual manner and a current of 300 amperes at 6 volts was utilized and found to be suitable. The strip zinc was arranged so that it would uncoil with as little friction as possible; passing from the coil it entered the tank over a steel roller contact, then down into the solution, passing over a composition roller through the length of the tank, over another composition roller, and then out of the solution over another steel roller contact. From the roller contact the plated strip passed through felt which had a light pressure and the surplus solution thus passed back into the tank again. The strip was then passed through rinsing water, through heated sawdust the excess of which was removed by air blowing upon the strip and it was then passed under a fine steel wire scratch brush to produce a bright finish. The brush was run by a motor so arranged that the pressure of the brush could be adjusted as it became worn. From the brushing operation it was re-coiled and was then

The proportions given in this solution were for copper. When bronze plate was required an addition of 2¼ ounces of zinc cyanide was made per gallon of solution. The free cyanide and hydroxide contained in the solution holds the zinc in solution without any further addition of cyanide. Bronze anodes of an equal composition were used. Brass can also be deposited in the same manner, but by utilizing more zinc in the solution and brass anodes. The strip passes through the solution at the rate of two running feet per second and if we figure this out we shall find that twelve and a half miles of the strip can be plated in ten hours. Twelve and a half pounds of metal are deposited upon one hundred pounds of the zinc strip of the 1½ inch size. This solution cleans and plates at the same time as the strip passes through the solution.

Experiments have been made with the upkeep of the solution and so far reduction from the anodes and solution is uniform, likewise the chemical decomposition, so it has been found possible to make additions to the solution on a uniform basis each day.

This method opens up great possibilities of plating



A GRAPHIC SKETCH OF HOW RIBBONS OF ZINC OR OTHER METAL ARE AUTOMATICALLY PLATED, CLEANED AND DRIED.

ready for lacquering, this now requiring a separate operation although the company manufacturing these labels is intending to continue the operation of lacquering and drying as one operation. Patents have been applied for by the company for this mechanical method of plating.

The solution for cleansing and plating the zinc in one operation was a problem to solve; but it was decided that a similar solution to the one given in the article on "Progress in Electro-Plating" which appeared in the January, 1916, issue of THE METAL INDUSTRY would probably answer the purpose. For this particular purpose a modified form of the solution was used based upon the following proportions:

Water	1 gallon
Sodium hydroxide 78%	4 ounces
Soda ash 58%	4 ounces
Sodium cyanide	6 ounces
Copper cyanide	6 ounces

The temperature of the solution was maintained at 210 degrees Fahrenheit and the method of heating was by external application of natural gas to the bottom of the tank. The voltage used was six volts and 300 amperes on about 8 feet of the zinc surface. If the dimensions were 1½ inches wide by 8 feet long then two sides of the strip would approximate 2 square feet of surface or 150 amperes per square foot.

steel with the various metals. The alkaline zinc cyanide solution as outlined in a paper recently presented before the convention of the American Electro Platers' Society, has proven so effective in plating steel strips with zinc that many automobile rim manufacturers are installing these solutions to take the place of the sulphate method. The results so far are more adherent, less crystalline and more uniformly distributed, deposits in 50 per cent. less time, and the solutions have higher electrical conductivity. The deposits from the alkaline solution have withstood entirely satisfactorily all the important tests such as (immersion in) copper sulphate solution, bending and heat tests.

In connection with the alkaline zinc solution, I desire to recommend the use of high test sodium cyanide only. It will be found preferable to the so-called cyanide mixtures. These mixtures contain besides sodium cyanide, certain salts or other inert substances and are intended primarily for use in molten baths for the heat treatment of metals. For electro-plating, the important element is cyanogen, and this may be most advantageously secured by using high test sodium cyanide only.

There are still a few of the old time platers, who insist that potassium cyanide gives better results than sodium cyanide, but I propose to show that the superior qualities claimed for the potassium cyanide are erroneous.

The value of cyanides in plating operations, depends

upon their cyanogen content. The greater the proportion of cyanogen contained in a given cyanide, the smaller is the amount of that cyanide required to put a given amount of metal in solution. If the metals, sodium or potassium, were the prime factors instead of the cyanogen, then any salt of these metals, as for example, chlorides, sulphates or carbonates could be used instead of the corresponding cyanides for deposition, but we note that this cannot be done and accordingly it would seem proven that the cyanogen is the important constituent for electro-plating.

Now high grade sodium cyanide contains 51-52 per cent. cyanogen, whereas, potassium cyanide contains only 38-40 per cent. cyanogen. Hence, from the standpoint of cyanogen content, it is evident that sodium cyanide has great advantage over potassium cyanide.

It may still be claimed, however, that in spite of this advantage in the cyanogen content, better results are obtained when cyanogen is supplied in the form of potassium cyanide instead of sodium cyanide. I may refute this claim and offer further proof of the advantages of sodium cyanide over potassium cyanide, by describing the following tests which were made with a copper solution and covering a period of two months.

Two solutions were prepared, identical as far as metal and cyanogen content were concerned, the one being made from sodium cyanide and the other from potassium cyanide. It may be noted here, that the amount of sodium cyanide required for the one solution was approximately one-third less by weight, than the amount of potassium cyanide used for the other solution, owing to the higher cyanogen content of the former.

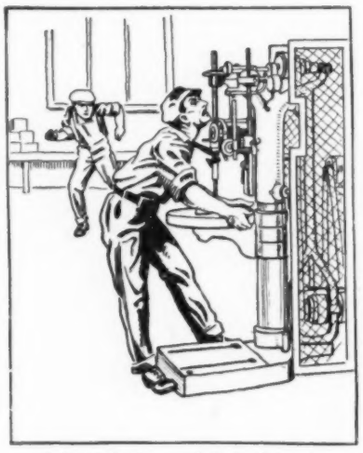
The two solutions were run identically using the same electric current, and the same temperature conditions and were continued in operation, until the cyanide was completely exhausted. and no further reduction of the metal could be obtained. The anodes and cathodes were then accurately weighed, the surface areas measured. The results were somewhat surprising, as the solution made from cyanide of sodium had reduced 25 per cent. more metal from the anodes before exhaustion had taken place, than the solution made from potassium cyanide.

This experiment carried on for over two months under identical conditions, showed that in addition to the original advantage which sodium cyanide possesses due to its greater cyanogen content, and resulting in a saving of one-third by weight in making up the solution, there is also an increase of about 25 per cent. in the effectiveness of the cyanogen content during operation of the solution.

From the above, it is very apparent why the great commercial plating industries through tests of their chemists and the practical results obtained by their expert platers, have adopted cyanide of sodium in place of cyanide of potassium.

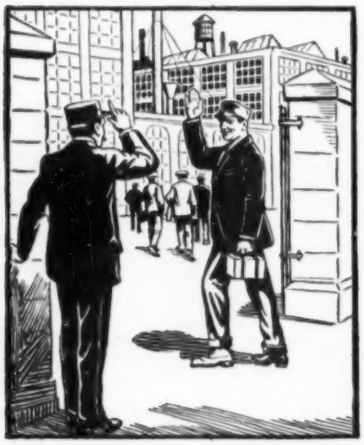
SOME SAFETY FIRST AND HEALTH HINTS.*

A First Aid Kit is a valuable asset.



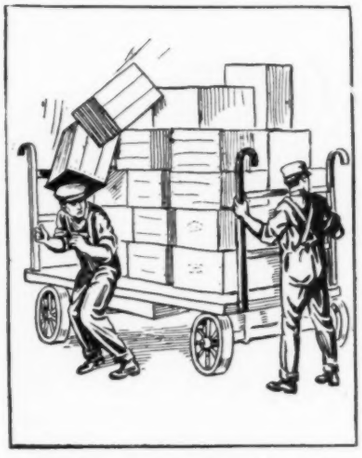
A loose-flowing necktie is dangerous.

"Watch your step!"



A cheerful good morning starts the day right.

Common sense should not give place to style.
From the "Spirit of Caution."



It is better to attend to one job at a time.

BRONZE STATUARY AND ITS PRODUCTION IN ANCIENT AND MODERN TIMES

A Complete and Exhaustive Description of the "Lost Wax" Molding Process.

By George Frederick.

(Continued from September.)

We proceed now to where we broke off in the general description. The outer mantle, when set, is removed, and where the previously applied loam projections over the wire loops were placed there will be indentations on the inside of the outer mantle; these are now extended into apertures right through the mantle; the loam coverings of the wire loops have served their purpose and can now be discarded. Fig. 3 shows the wire staples and the impression of the loam projections on the outer mantle, but not the apertures; these will be seen in Fig. 4, and are somewhat conical. When the second half of the outer mantle has been completed in like manner to the first, and when the whole is fairly dry, it is taken adrift, and each inner segment is fastened by a piece of string through the wire loop into each respective recess on the outer mantle, and the string is tied over a wooden peg to hold each section in place and all close together. The mold appears then as shown in Fig. 4—the original pattern has been removed, and the dotted line shows where the two halves of the outer mantle join. The mold, when perfectly dry, is taken adrift again, and after each section has been well oiled a thin layer of wax of uniform thickness is pressed gently, but firmly, into each segment and trimmed flush all round, so that the wax layers in the complete mold, when put together again, will form butt joints with each other; in fact, a continuous layer of wax has been formed of the same thickness as that of the finished casting is to be. The mold is then put together in two halves, and if the statue is of the whole figure of the human or animal form, or an equestrian statue, an iron skeleton must be made to support the core. In the case of a head as shown in our illustration, a bent iron bar with a few cross-pieces will suffice. The core is made of clay mixed with sheep's wool, and dried from time to time until the whole of the mold up to the layer of wax is completely filled. The core is now removed and is wound all round with fine iron wire and exposed to heat until it is properly baked; this done, it is painted over with a slurry of loam, wool, brickdust, and bone powder, and again dried, until it is thoroughly baked. The wax layer is now removed from the mold, and this is rubbed over with fat bacon, after either the mold or the bacon has been warmed, in order that the fat may penetrate the plaster better. The mold is now ready for the attachment of the channels through which the wax is to be poured in. The core having been secured in its relative position to the mold, and the latter having been firmly tied together and stood upright, a few air-holes are provided. The air-holes for a head like that shown in our illustrations are not of the same importance as in a whole figure, where there must be air outlets at the hands, at the lowest part of the feet—in fact, at all prominent points from which the air might be unable to find vent when the wax is poured into the mold. To make these air-holes, carefully bore through the mold in a downward direction, being careful that no dirt falls into the hole. The air-holes are all connected by hollow reeds, all joints being secured by plastic clay so that none of the wax can escape. The wax thoroughly melted and quite hot may now be poured into the mold, and afterwards remains for a day or two, according to the weather, undisturbed, to cool. The outer mantle is now freed from whatever held it together; and after all the strings are loosened which hold the inner compound mold to the outer mantle, and the latter removed, the sections of the compound mold are carefully taken off one at a time. In the time allowed for cooling the wax has shrunk somewhat, so that there will be no difficulty in freeing the finished wax model from all encumbrances. The model must now be cleaned from all traces of fins which show at the joint of the mould, and any other finishing touches can now be given.

The foregoing is the method as described by Cellini; but we would point out that when fitting thin slabs of wax into the sections of the compound mold it is scarcely necessary that these should be pressed into all minute recesses, as it would not matter if elevations at extreme points were somewhat thicker in bronze; neither is it necessary that wax should be used for this purpose—any pliable substance, such as dough, clay, putty, etc., would do. The core, instead of being made as Cellini prefers it, may, with advantage, be made of powdered brick and calcined bones in equal parts. This process has also been described by Cellini, but, as we have seen, he gives the other method preference. What must appeal to most in the second process is the fact that the plaster of Paris mixed with its ingredients of brick-dust and calcined bones can be made into a slurry and thus poured into the mold and allowed to set, which saves a great deal of trouble in the production of an intricate core. When the core thus produced has set, its further treatment is the same as already described. When pouring the molten wax into the space between mold and core it

CELLINIS PROCESS.

FIG. 3—FIRST STAGE.

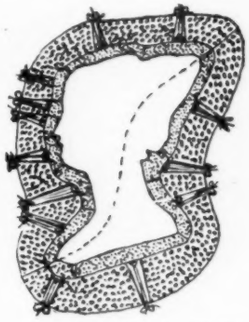


FIG. 4—SECOND STAGE.

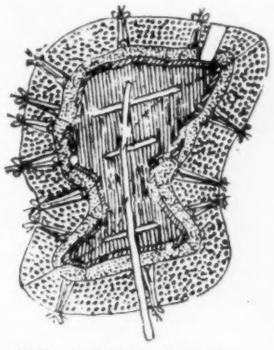


FIG. 5—THIRD STAGE.

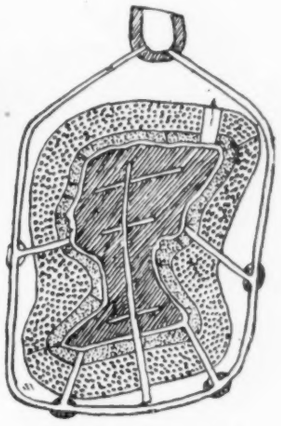


FIG. 6—FOURTH STAGE.

should be borne in mind that it is best to let it run in at the lowest point, and so gradually fill; in this way it is more likely to fill without missing anything. The arrangement of the ducts for leading the wax into the mold is shown in Fig. 6, while Fig. 5 shows the preliminary laying out with wax in which the core is formed. It will be noted that this layer of wax (or whatever substance it may be) does not fit close at such extreme points as the nose, the lips, and the little curl in the nape of the neck; this simply means that these parts are a little thicker in the wax model and, consequently in the finished bronze (see Fig. 6). The finished mold for casting the bronze is shown in Fig. 8, which shows the inlet for the liquid metal, and the vent for the air, and all the necessary channels for conducting the liquid metal into the mold and those through which the air is to escape. It is true that all these channels fill eventually, and the surplus bronze congealed or set in them has to be removed when cleaning up the bronze.

CELLINIS PROCESS.

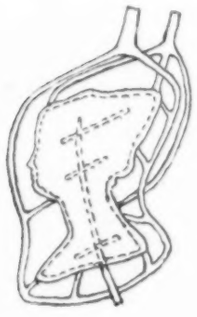


FIG. 7—FIFTH STAGE.

FIG. 8—SIXTH STAGE.

We have already seen from the earlier part of this It is important that the first layer over the wax is exceedingly fine—in fact, impalpable; and layers are repeatedly put on with a brush, and allowed to dry successively, and so gradually build up the mold, the material getting coarser towards the outside. When finished, the mold must be self-contained, enclosing all channels, as essay how the wax model is to be enclosed by the mold. shown in Fig. 8, and should, for large objects, be even strengthened by iron hoops before casting, but in any case they should be tightly rammed into the sand of the casting pit.

A further development in the production of bronze statuary took place in the nineteenth century; we do not mean to say that the "cire perdue" process was superseded, but simply that a new method came into vogue which was adopted by many, principally on account of its being less expensive. This system is more or less on the lines of the modern foundry practice, in which form boxes are employed, and in which the mold is made of sand, which latter is made plastic by additions of clay or loam. The mold always consists of at least two halves, each of which is contained in an iron foundry box, casting-box, form-chest, or frame-mold, as they are variously named. The credit of the application of this foundry method for art work is due to the French, and the name of Rousseau has been coupled with the system, whose earliest efforts date back to 1798. At any rate, whatever bronze castings or statuary were made before the nineteenth century were generally formed in loam and not in sand.

In this system the preliminary plaster mold can be dispensed with, as the mold is here formed directly upon the model, and all projecting or undercut parts must be formed in the same mold; this often necessitates a great number of small segments. Sometimes such portions can also in this system be disregarded when molding, but the parts in question can be cast separately and fitted afterwards on to the bronze. On rare occasions such minor details have been formed on the "cire perdue" process and inserted afterwards into the sand mold. The mold for sand casting is similar to that for loam casting, and, indeed, not dissimilar to the process in which the plaster mold is made for the wax model. The model is generally of plaster, and is laid in loose sand just as before, but instead of forming a compound mold of plaster it is here formed of sand and molded upon the original model; the small sections are also in this case strengthened by a plaster mantle, but they are not held in place by strings, as they can here be held together by pins. The mold is taken adrift in order to remove the pattern or model, and the core is formed either in the same mold or in a core-box; if formed in the mold it must be trimmed all round to allow for the thickness of the metal forming the statue; the core must also, as before, be supported by an iron skeleton. When core and mold are dried they are assembled again, and the usual inlets and outlets for metal and air are made when the mold is ready for casting. As there is a danger of spoiling the mold when forming a core in it, it is generally found expedient to make a separate mold specially to form the core in; or the core can be cast of the before-mentioned mixture of plaster, brick-dust and animal charcoal. If this method is resorted to, the original mold is generally lined with clay slabs of the thickness of the metal that is to be. These slabs are prepared with a tool like the domestic rolling-pin; but as they require greater accuracy in thickness than the proverbial piecrust, these implements are fitted with knobs or discs at the ends, which project half an inch beyond the thickness of the rolling-pin for rolling out a half-inch slab, and so on.

(To be continued.)

MELTING ALUMINUM CHIPS.*

The Department of the Interior, Bureau of Mines, has issued Bulletin No. 106 on Melting Aluminum Chips, by H. W. Gillett and G. M. James. This bulletin goes very exhaustively into the question of melting aluminum chips and thoroughly covers the ground and gives a complete resume of the existing literature on this important subject. The first part of the pamphlet is taken up by a description of the nature of scrap aluminum and the various forms in which it is found on the market is discussed.

Following this comes the description of the methods of melting advocated in metallurgical literature. Descriptions of experiments of melting aluminum chips and general methods of making tests and various ways of melting together, with the kind of chips used and control of temperature, and so forth, take up the next twenty pages. Then follows a summary of results by means of various methods of melting and the matter of melted briquetted chips and borings is very thoroughly gone into. The latter part of the pamphlet is devoted to the effects of the various impurities on aluminum and the pamphlet is concluded by a chapter on the probably relative usefulness of different melting methods.

Taking it all in all this pamphlet makes a very valuable addition to the existing literature relating to the handling of scrap aluminum and it certainly would be advisable for those engaged in the metal business who come in contact with this class of metal to send to the Bureau of Mines, Washington, D. C., for a copy of Bulletin 108.

*An advance abstract of this bulletin was published in THE METAL INDUSTRY for October, 1915.

DESIGN IN ART METALWARE*

SKILL IN DESIGN AND EXECUTION CAN ADD AN ESTHETIC AND ARTISTIC VALUE THAT WILL MAKE ANY METAL PRECIOUS PROVIDED IT IS SUITABLE FOR THE PURPOSE INTENDED.

BY A. F. SAUNDERS.†

Broadly speaking, the term "art metalware" covers a very large field. To the average mind the work of the gold and silversmith takes first place, followed closely by the various other lines made from the less costly metals, such as bronze, copper or brass.

Aside from the intrinsic value of the metal, and considered purely from an unbiased point of view, there is no good reason why an article made from any of the less precious metals should not possess just as high a degree of esthetic and artistic value as though made of either gold or silver, provided that it is in every way appropriate for the purpose it is intended to serve.

BRONZE DESK SET. EXAMPLE OF THE VALUE OF GOOD DESIGN AND COLOR CONTRAST IN METALWORK.

Obviously a teaspoon made of bronze would not be appropriate, however artistic it might be in design and execution, but there are manifold uses for these metals in articles made to beautify the rooms of our homes as well as to serve a purpose of utility. The wide range of color effects possible to attain on bronze, copper or brass, the many decorative combinations possible to make with these metals, including a limited use of silver or gold, offer to the metal designer no end of problems that may be worked out with highly artistic results. It matters not what the nature of a material or its base value may be, it possesses esthetic possibilities if its limitations, manipulations and proper finish are thoroughly understood.

Unquestionably an article designed to serve a purpose of ornamental value must appeal to one's sense of beauty in order to inspire a desire for its possession. Again it must be not only beautiful in itself, but must serve to make more beautiful its surroundings. We all buy what appeals to us and what accords with our conception of good taste; our ideas are largely influenced by sentiment, which plays an important part in the sale of any object dependent upon artistic conception. Without some sentimental value to us, either from its associations, general design, color, or esthetic appeal, it would fail to create any desire in us for its possession. It is this sentimental value that makes dear to us the old silver of our ancestors, conceived and fashioned by the craftsmen of Colonial times. It is sentimental value that influences our preference for certain of the period styles of ornament; the designer is more susceptible to sentimental value than he sometimes realizes. He is forever striving for something new, something original and different than that before. This spirit is essential to our progress, but we should not overlook the value of the sources of our inspiration.

The importance of design in the development of the art metal industry is evident; it is the very foundation upon which depends to a large degree the successful sale of the wares. From the viewpoint of the extremist, true art value exists only in strictly hand-made work, conceived and executed entirely by the mind and hand of the craftsman; such a theory is most fallacious, for were we dependent upon the limited output of such

ANTIQUE BRASS FERN DISH. EXAMPLE OF A DESIGN INSPIRED BY EGYPTIAN DECORATIVE ART.

strictly hand-wrought articles, both price and scarcity would confine their possible purchase and possession to a very few.

Co-operative effort in our factories today is producing lines of metalware that embody the highest order of art, both in design and execution. Not only is this fact true in the work of the gold and silversmith, but

*From the Keystone Weekly.
†Designer for the Benedict Manufacturing Co., East Syracuse, N. Y.

also does it apply to the efforts of the designer and craftsman working in the less valuable metals. It requires just as thorough an understanding and application of the fundamental principles governing line, form and composition in the designing of—we will say a bronze desk set that it may fulfill both in a practical and decorative manner the purpose for which it is intended to serve, as does the designing of a table service in sterling.

SILVER AND BRONZE CIGAR JAR. EXAMPLE OF DESIGN AND COLOR HARMONY IN FINISH.

Design is expression—it cannot be taught any more than one can be taught to compose music. We can learn to draw, to master color harmony and to think along right lines, but the power to create must be born in us. There is no formula that the designer may follow—no fixed rules. If there were we might assume that there would be little variation in the work of designers. There are, however, certain principles that we know are fundamentally correct. The designing of art metalware, aside from its art phase, requires a thorough knowledge of the nature and possibilities of the materials used, the various processes and uses of the equipment required to obtain the desired results. From the forming of the shape of any particular article in hand through to its final finishing, it is not artistic achievement alone that is sought, but the all important commercial side must be ever in mind, for, after all, it is salable wares that spell success. The several illustrations herewith shown serve to emphasize the importance of design as applied to metalwork of this character. The desk set in French bronze, decorated with ivory cameos and simple engraving, carries out both in line and color contrast the spirit of the prevailing styles of interior furnishings and decorations.

The fern dish of antique brass while Egyptian in character is thoroughly original and modern in conception, simple in design, the decoration filled in with a Nile green, the whole forming a most pleasing and striking ensemble.

The design for a cigar or tobacco jar received its inspiration from the "Viking Age," the old Norse boat, and setting sun in dull silver overlayed on bronze.

THE CHEMIST AND THE BRASS-FOUNDER*

AN ENGLISH WRITER GIVES HIS VIEWS AS TO THE VALUE OF THE CHEMICAL CONTROL OF METAL PRODUCTION.

BY R. T. ROLFE, F.I.C.

(Continued from September.)

CASTING TEMPERATURE OF GUN METAL.

The casting temperature of gunmetal does not seem to make much difference in the structure. To determine casting temperatures, we use the pyrometer to some extent. It is, of course, unnecessary to use it with every melt, because a good furnaceman can gauge accurately enough the temperature he usually pours at. But he would not know what that temperature was without actually determining it, and it is useful to know it, so that a comparison may be made with the work of other founders. With us, the usual temperature to which the metal is raised, before pouring into the shank ladle is, in the case of the tilting furnaces, about 1,250° C., as determined by the Foster pyrometer. After pouring, the metal in the ladle is at 1,200° C., and this is about the usual temperature for pouring into the mold. It, of course, cools a little more in the interval before pouring.

To test the effect of casting at different temperatures, two test pieces were cast in sand at four different temperaurs, 1,200, 1,150, 1,100 and 1,050° C., these being the temperatures of the metal in the ladle before pouring into the mould. On turning up and breaking the test pieces, the following results were obtained:

	Casting temperature. Degrees C.	Yield point. Tons per square inch.	Ultimate Br. strain. Tons per square inch.	Elongation. Per cent.
1.....	1,200	11.3	17.8	18
2.....	1,200	10.9	18.1	20
3.....	1,150	12.4	18.6	17
4.....	1,150	12.2	18.0	20
5.....	1,100	11.5	18.3	16.5
6.....	1,100	11.0	19.1	22
7.....	1,050	12.4	18.2	16
8.....	1,050	11.9	16.6	10

There is little difference in the results, except that as regards elongation those cast at the higher temperatures, 1,200° and 1,150°, are somewhat better. The only decidedly poorer one is the last of the two poured at the lowest temperature when the metal was getting very pasty and on the point of beginning to solidify. The micro-structures were all much the same. I believe it is the general opinion that the casting temperature makes a good deal of difference in the structure and strength of the metal, but the only possible opinion one can hold is that which has been tested by oneself.

In the case of a larger melt, of about 3 tons of metal, in

*Read before the London branch of the British Foundrymen's Association.

the air surface, during tapping to cast a 28-in. pump, the following temperatures were obtained:

	Degrees C.
Temperature of metal in furnace before tapping.	1,350
" " " in ladle after tapping....	1,300
" " " in ladle before pouring..	1,200

These are about normal temperatures for this furnace, and they show that the metal before pouring has attained about the same temperature as in dealing with small quantities in the tilting furnaces. The results from the test piece cast on to the 28-in. pump above mentioned were as follows:

Yield point..... 11.0 tons per square inch
Ultimate breaking strain.... 16.4 tons per square inch
Elongation ..... 14.5 per cent.

The brands of copper, tin and spelter used were the same as in the other experiments just described, which were made at practically the same time. Results obtained from a cast-on test piece are always lower than those from one cast separately.

There are some other defects that may be met with in gunmetal, and have not yet been mentioned. These are so infrequent as to be almost negligible as sources of trouble. They may be briefly described as follows:

Blow-holes, caused by the escape of steam or other gases from the mould, under such conditions that they are not carried away, but remain in the solidifying metal. These cavities are generally near to the surface of the casting, and as the gases, on passing from the mould into the metal, exercise a pronounced chilling upon the molten metal with which they are in contact, the holes can be recognized by the difference in structure of the metal surrounding them, this being the same as is obtained in chill casting.

Gas Holes are caused by the liberation of gases dissolved in the molten metal, and may occur in any part of the casting. The metal forming the boundaries of these holes naturally does not show the chill structure characteristic of the blow-holes, and the difference between the two is thus readily distinguishable.

Inclusions of Copper Oxide are caused by oxidation in melting. Copper oxide, being a hard and brittle compound, causes weakness. As a matter of fact, the production of copper oxide is almost entirely obviated by the presence of the 2 per cent. of zinc added to the gunmetal. Zinc, being a very oxidizable metal, combines with any oxygen that may be present, either combined with any of the other metals present, or existing in the free state dissolved in the molten mass, with the result that the metal is more fluid or "runs thinner," as it is described.

There is one thing that is worth mentioning before leaving the consideration of gunmetal, and that is that by annealing at a temperature of about 700° C. for quite a short time, about half an hour, it is possible to decompose all the eutectic, replacing it by solid solution of tin in copper, and thereby materially increasing the tensile strength and elongation of the metal. There are, of course, practical difficulties and some risk of injury in annealing castings, especially those of any size, under such conditions, but the point is obviously of some practical importance.

There is, of course, much other interesting material for discussion in modern brass-foundry practice, some of which only comes under secondary consideration for a chemist. I have, therefore, not attempted to deal with such a matter as the layout of the foundry, with which the foundryman is far more conversant than the chemist. There are, however, one or two details of our procedure that may be of interest.

Morgan's tilting crucible furnaces are used, coke-fired, with forced draft. In the case of a 200-lb. pot five heats can be obtained per working day of 9¾ hours, and with the 400-lb. pots, four heats. It is, of course, not generally necessary to drive them as hard as this. An air furnace, capable of melting about 4 tons of gunmetal, is used for larger quantities.

For the drying of cores and moulds for the larger work, Hislop's drying ovens, fired by producer gas, are employed. By this means thorough drying is insured. Compressed air is, of course, used for cleaning up the moulds. Shot and other scrap metal is recovered from the ashes, sweepings, etc., by putting through rolls and sifting. The ash metal is melted down from time to time, analyzed, and used for any suitable purpose.

BEARING METALS.

Considering next the subject of bearing metals, the foundryman is very often casting two or three types of bearing metal in the same foundry—in our case, three. I suggest that it is valuable for him to know, as he sometimes does, all about the characteristics of a bearing metal, and the reasons for sometimes using one and sometimes another in engineering practice. If he does, he has a lively interest in those bearings he is casting, which interest it is impossible to have without a knowledge of what constitutes a bearing metal and why.

For example, we are casting white metal to Admiralty specification, phosphor bronze, and a lead anti-friction alloy. The foundryman should know when that fairly hard metal phosphor bronze can suitably be used for bearing purposes; when it must be replaced by a softer and more plastic metal, and the advantages that Admiralty white metal has over a much cheaper metal having lead as its base.

The objection may be made that he will not be able to cast them any better for knowing this, but they will at any rate appear in a new light to him, and it is certainly necessary to have some knowledge of bearing metals to be able to appreciate that alloys of some composition, even some of those that are on the market, are not good bearing metals, and why, and the reason why a slight alteration in their composition may sometimes render them much better.

What are the characteristics of a bearing metal? When two metals in contact under pressure have relative motion between them, there is a certain friction set up, and this increases in proportion to the pressure, until a certain point is reached, after which there is a great increase in the friction, and heat is developed. In the case of hard metals, the co-efficient of friction is smaller than with soft ones, and the pressure necessary to produce that sudden increase in the friction is also greater; so that from these considerations the conclusion is formed that a bearing metal should be a hard metal, as, of course, it should. If, however, it were not only a hard, but an unyielding metal, and there were inequalities of adjustment between the shaft and the bearing, then the shaft would be resting only on a few points, and at those points scoring would occur, with the development of considerable heat. Therefore, a bearing metal must be sufficiently plastic to make up for those inequalities of adjustment, and these qualities are obtained with a bearing metal, which consists of hard grains embedded in a comparatively soft groundwork. If a soft metal, such as lead or tin, is alloyed with other metals capable of forming hard compounds able to crystallize out in the cooling mass, a bearing metal is produced.

(To be continued)

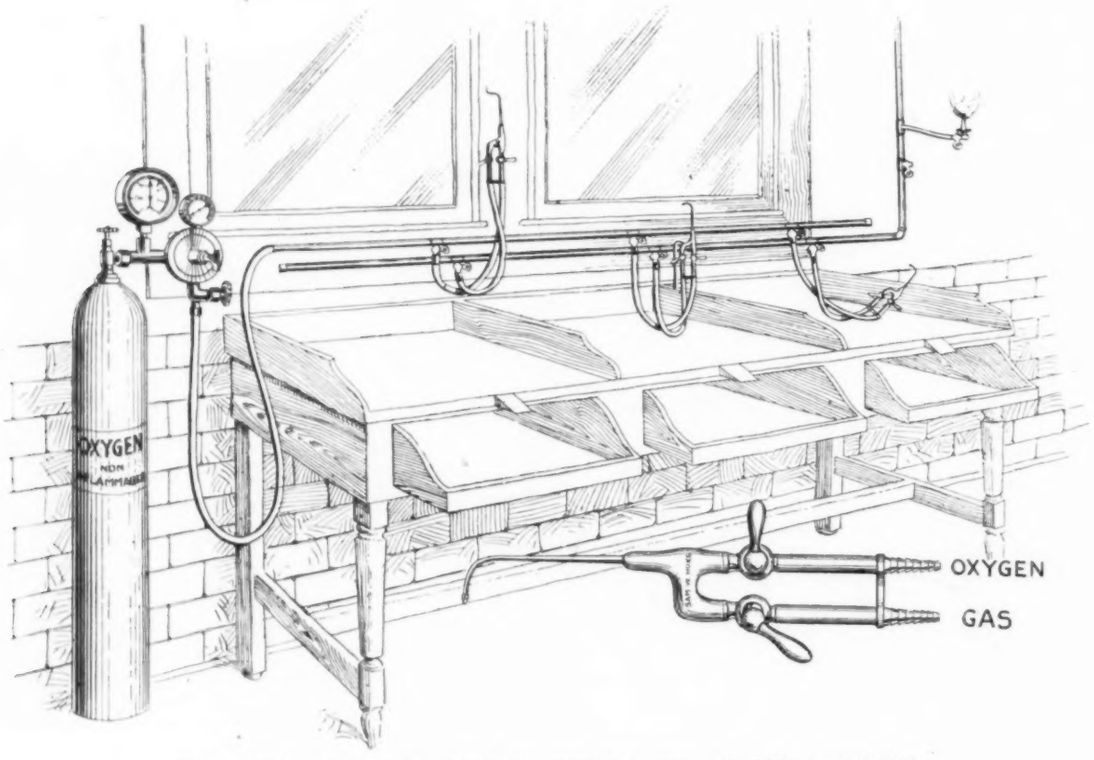
THE MELTING OF PLATINUM

AN ILLUSTRATED DESCRIPTION OF PRESENT AMERICAN METHODS OF MELTING AND WELDING PLATINUM, THE EQUIPMENT USED, THE TECHNIQUE AND COST OF OPERATION, AND THE DIFFICULTIES ENCOUNTERED.

WRITTEN FOR THE METAL INDUSTRY BY C. M. HOKE, A. B., B. S., A. M., CONSULTING CHEMIST, JEWELERS' TECHNICAL ADVICE COMPANY, NEW YORK.

IN II PARTS. PART II.

In the September issue of THE METAL INDUSTRY, the process of melting a medium sized quantity—100 pennyweight—of clean platinum clippings, was described in detail. Briefly, the clippings or scrap are stacked up against one side of a broken-down sand crucible, and a naked flame is turned directly on them. The fuel is ordinary illuminating gas or natural gas, with oxygen from a tank, and a regulator is used to insure the gentle uniform delivery of the oxygen. Usually the crucible is set inside another larger crucible, or in a pit gouged in a refractory brick, in order to save heat. No flue is needed, and the rest of the equipment is the blowpipe,



THE LARGE AND SMALL MELTING TORCHES FOR MELTING PLATINUM.

tubing for gas and oxygen, blue glasses, tongs, anvil and hammer. This process is carried on daily in hundreds of jewelry factories and refineries. The method of melting quantities up to 40 ounces is about the same as for smaller quantities; above that a lime crucible is usually used, and for very large melts, of over 100 ounces, it is well to use two torches together.

The cost of melting platinum scrap is very low, ranging from 0.4 of a cent an ounce when large lots are melted, up to 10c. an ounce when only a few pennyweight are melted at a time; five cents an ounce is about average. It pays to melt quantities as small as 2 pennyweight.

The article also described other less common methods, other fuels and crucible materials, and so on.

MELTING PLATINUM FILINGS.

Melting filings is a slightly different task from melting clippings or scrap, and it is unfortunate that some platinum workers have the idea that it is much more difficult. The fact is that while it takes longer to melt filings than an equal weight of scrap, that is the only difference of any consequence, and the results are just as satisfactory if proper care is used. The refiners charge much more for melting filings than clippings, so that the economy in melting one's own filings is correspondingly greater.

Jewelers are apt to use on platinum the same methods that they have always used on gold. Now it is easy to refine impure gold by melting and remelting it, but it is not so easy to refine platinum filings that way, though it *can* be done. It is much easier to refine them *before* melting them; and if this refining is properly done, (which is not hard,) the melting is easy and successful.

It takes longer to melt filings because the many small surfaces and angles on them radiate the heat; also, since they are so fine, a very gentle flame must be used at first, or some of them may be blown out of the crucible. These two reasons make it take about twice as long, on an average, to melt filings as scrap.

MAKING THE MELT.

As in the case of scrap, the filings are placed in a sand

crucible that has been broken down on one side. The quantity most commonly handled is about 50 pennyweight, though it pays to handle only one or two pennyweight; large factories will handle as much as 600 pennyweight to a melt.

The crucible, as mentioned before, is set within another crucible, or in a refractory brick, to save heat. Then both are set within a sheet-iron screen, which can be swept out afterwards if any of the filings are blown about, as sometimes happens, especially with beginners. The filings are banked up against the high side of the crucible. A gentle flame is turned on, with enough gas and oxygen to give a great heat without blowing or noise. This is directed at the bottom of the stack of filings, and is very slowly brought toward them. The workman watches carefully, and soon he will see the top layer of filings melt and run together. With that he gradually brings his flame closer, and finally turns it on full pressure, exactly as if he were melting clippings.

From there on the method is the same as for clippings; the metal melts and runs down into the bottom of the crucible, the flame is moved about over the mass until it is entirely molten, and runs around like a little pool of mercury. While still white hot, the button is lifted out and placed, upside down, on a flat piece of old crucible, or fire brick, and its rough underside is sweated smooth by the flame, to free it from sand and roughness. Then, while still white hot, it is hammered, and rolled as soon as cool.

This is another instance where the treatment of platinum differs from that of gold; gold is not hammered while hot, but platinum is better the hotter it is when hammered, as the pressure makes it denser and harder; moreover when it is rolled the pressure should be as great as the rollers will stand. When a crucible full of molten gold cracks, the result is usually a tragedy; but if a crucible of platinum cracks, no attention is paid to it, as there will not be any loss, and probably no inconvenience. Another difference is that it is not necessary to anneal platinum, except in one instance—where a workman suspects imperfections (see below) and annealing will make them more conspicuous if present.

A melt of 100 pennyweight of filings should not take more than ten minutes; often it is done in one or two. But so frequently is there dirt in filings that it is customary to melt the button over again.

REFINING PLATINUM FILINGS.

The dirt in the filings, which is the cause of nine-tenths of whatever difficulties come in melting them, may be of several kinds, as one would expect on considering where they came from in the first place.

They were brushed up from the jeweler's bench; therefore they contain particles of wood, steel from the files, dust, hair from the brush, solder, and if the shop handles gold jewelry there is *always* gold in the filings. Other materials are shellac, bits of asbestos, tobacco, emery, plaster-of-paris, borax, charcoal, paper, and other trash. No matter what precautions are taken, it seems to be impossible to keep platinum filings separate from gold filings if the two metals are worked in the same shop; this has been verified repeatedly. The only way to do it is to keep the two metals in separate rooms.

When the workman is ready to melt his filings, he usually begins by taking out the steel (partly) with a magnet, and perhaps he heats them in a frying pan to burn out paper, wood, and other organic dirt. The result is to convert the latter into cinders. For good results, it is, of course, necessary to do more than this. If gold is present it must be removed by some refining method, which at the same time will take out the other kinds of dirt; this is being done regularly in hundreds of factories.

If there is no gold, a washing with nitric acid will be about all that is needed after the burning and the treatment with the magnet. This does not dissolve the cinders, of course; only the base metals; but in rinsing off the acid most of the cinders are washed off also. Then when the filings are melted the other dirt, such as sand and emery, fuse into a sort of slag that can be swept by the flame away from the button of metal. No flux is used at all. Setters' filings, which contain a great deal of shellac, are often boiled in caustic instead of being burned in the frying pan, as the caustic will dissolve the shellac and most other organic dirt.

DEFECTIVE METAL.

Incorrect or slovenly refining is the cause of most defective metal. It must also be remembered that platinum solder is not platinum, and that if it is mixed with the filings in any large quantity, it must be removed the same as gold; otherwise it will cause the same trouble as any other dirt—dirt being, by definition, matter in the wrong place. Dirt shows itself by a smoke that rises from the metal during and after melting. Sometimes in addition the surface of the button is black, other times warty or pitted. A button that smokes or has a bad surface should be hammered with care, as it is apt to shatter under the hammer.

Such buttons should be rolled out as thin as possible, cut up, and the pieces stood on edge in a *clean* sand crucible, and remelted exactly as if they were clippings. It is well to let the flame play a few seconds on the metal after it is molten, so that dirt will burn out. There is practically no loss of platinum in this, but there is supposed to be a minute loss of iridium. Sometimes a defective lot will have to be remelted a half dozen times before it is usable. It is plain that while the metal can be refined this way, it is much more profitable to clean the filings before melting them.

These remarks on dirt apply just as well to clippings as to filings, of course, though the only dirt that is common in clippings is solder. Sometimes white gold is mixed with platinum, and sometimes clippings consisting of two sheets of platinum soldered to a central sheet of gold (or other metal) will get into a melt. This should be guarded against carefully, and if there is doubt, the safe plan is to take it for granted that "dirt" is present, and to refine accordingly.

Incomplete or slovenly refining will leave gold, silver chloride, and probably copper in the material. Gold shows itself by a bronze or purple stain on the crucible; silver chloride leaves a darker stain and gives a characteristic smell; copper shows itself by coloring the flame green during the melting.

DIFFICULTIES NOT DUE TO DIRT.

Now and then perfectly clean platinum will yield a defective button when melted; it may be brittle, or pitted, or "double." All of these may be remedied by one remelting, and they do not occur after a careful melter has had a little experience.

When a button is brittle, and the color of the crucible indicates that the trouble was not due to dirt, it is pretty sure to be due to an improper flame. Usually the oxygen was turned on much too hard; this leaves the button warty, but white. Then, sometimes a workman will, after finishing the melt, turn off his oxygen and let the smoky flame play on the hot metal; this gives a warty and brittle button that is more or less gray. These warty buttons should be remelted even in such cases

as are not brittle, because they are apt to show imperfections when rolled down very thin.

Pitted platinum appears when the button is not properly sweated. Bits of sand stick to it when it is taken from the crucible; these should all be removed, and the pits smoothed out by turning the flame on the bottom of the button just long enough to make its surface run. This sweating is the work of a moment, but if it is neglected and the button goes into the rolls with a sandy and pitted surface, the result is usually very discouraging.

"Double" platinum is caused this way: part of the metal melts and runs down into the bottom of the crucible, where it cools. Later more metal runs down over the first part, and the two layers do not flow together. Later on, when the metal is rolled, a blister will show at the spot where the two layers did not join. If a workman suspects "doubles," he will anneal the metal after rolling, as this makes the blisters more conspicuous. The way to avoid this is simply to keep the bottom of the crucible hot all the time, and to be sure that all the metal is really molten before it is allowed to cool into a button.

The remedy for all these troubles—brittleness, warts, pits, and "doubles," is simply a remelting.

PLATINUM SPONGE AND PLATINUM BLACK.

These two are products of different methods of refining, of recovering platinum from solutions, etc. They are easy enough to melt as long as they are clean and free from other metals. Sponge is treated about like clippings; sometimes it is compressed in a die under a drop hammer, into a hard lump, and this makes it easier to melt. The platinum black is treated the same as fine filings.

When difficulties come, they are most apt to be due to lack of care in handling the orange powder from which the sponge is obtained. This powder must be washed carefully; it is usually filtered out of a solution containing dissolved gold, copper, and other metals, and if this solution is not rinsed off it, the result is bad platinum. But, if it is washed too copiously, a good part of the powder itself will dissolve and be washed away. The golden mean is not easy to attain; perhaps the best method is to wash the powder with a strong solution of ammonium chloride. But that is another story.

WELDING PLATINUM.

When a jeweler makes a piece of high grade platinum jewelry, he wants it to contain little or no solder,—it should be all platinum. This ideal is accomplished by *welding* the article with soft platinum. The article itself is hard platinum, containing probably 10 per cent. iridium; this has a higher melting point than pure soft platinum, so the latter is used as "solder" in making the weld.

The little torch in the picture was designed for this purpose. It weighs only a few ounces and gives a flame as sharp and fine as a needle, or one heavy enough for very large welds, or even for melting several pennyweight of scrap. Nozzles of different bore are provided for different purposes.

The big melting torch pictured in the September issue of THE METAL INDUSTRY can be used for medium and large welds, as it will give a surprisingly delicate flame. But for most work the little torch here illustrated is preferred.

When a piece of jewelry cannot be welded, a good workman likes to use very hard solder. With the old mouth blowpipe, hard soldering was a difficult task; indeed, some workmen could not do it at all. As a result, this little gas-and-oxygen torch, made originally for platinum only, was tried on hard solder, and soon came into wide use for that work. Nor has its field ended there; now it includes hard and soft gold-soldering, silver soldering, glass working and lead burning.

Like the big melting torch, it uses ordinary gas with oxygen from a tank, the oxygen being used at a pressure of less than a pound for soldering, and ten pounds or less for the largest welds. It is used exactly as the old mouth blowpipes or gas-and-air torches are, except that it is very much quicker.

The installation is clearly shown in the sketch; gas and oxygen are piped to the benches in the same way as the gas and air of the older method. One tank of oxygen can supply a large number of benches; one or all of the torches can be going at a time, as the oxygen regulator automatically takes care of the pressure.

The cost is low, and the saving in time over the gas-and-air method is more than sufficient to pay for the very small amount of oxygen that is used.

CONCLUSIONS.

As the use of platinum increases, and our knowledge of how to handle it grows, it becomes plain that it is no harder to work than gold, in spite of its very high melting point. The chief difficulties we have had to surmount is the human tendency to treat platinum in the way we have been treating gold, and the hesitancy at using the unfamiliar oxygen. As these are overcome, the popularity of the noblest of metals may be expected to grow still more rapidly.

CURE FOR PLATING SOLUTION POISONING.

Some persons suffer more from the effect of nickel solutions than others in the same manner as some are affected more by cyanide solutions than others. Nickel solutions seem to destroy the natural oils of the skin which becomes dry and cracks. Open sores then ensue and these become affected causing running, watery sores. If the following simple rules are put into practice the sores can be readily healed; but these rules should be thoroughly instilled into the minds of the workmen.

First—At the end of the day the hands should be washed thoroughly in clean water and then immersed for a few seconds in a rinse water consisting of one gallon of water and four ounces of borax. Then the hands should be washed again in clean water and dried.

Second—A mixture of equal parts of glycerine and sweet or olive oil should be kept on the hands and before the men leave the factory they should be made to rub a little of this mixture thoroughly into the skin.

Third—Where sores have already developed the employees should bathe their hands in warm borax water, using about six ounces of borax to a gallon of water. The hands should be immersed for a few seconds in this solution and then washed in clean water.

Fourth—After washing thoroughly in the borax solution the hands should be bathed for a few minutes in a solution consisting of one quart of hot water and ½ teaspoonful of carbolic acid.

Fifth—Then each evening before retiring apply Resinol salve to the sores and wear cotton gloves. In a few days the hands will become normal again.

A good laxative should be taken frequently to cleanse the blood. For this purpose obtain the juice of one good sized lemon and add it to a pint of water and then to this add two ounces of rochelle salts. A teaspoonful of this mixture should be taken each morning before breakfast as long as the sores remain. —C. H. P.

SEASON, CRACKING AND SELF-ANNEALING OF BRASS*

Some New Light Upon an Old and Much Discussed Subject.

By W. Arthur, Frankfort Arsenal, Philadelphia, Pa.

The world is using, and has used, such great quantities of this most wonderful of all the alloys that careful studies of most of its properties have been made. But only of recent years has much serious thought been given to one of its less prominent but most important peculiarities; self-annealing and seasoning cracking.

Since it requires several years for any self-annealing or seasoning cracking to manifest itself to any marked degree, it is to be expected that any extended study would be much delayed. Often the brass which might show this property is entirely used up, worn out or discarded long before any marked change in the metal has occurred. However, there are instances where it may be necessary to store the brass or its use may extend over a period of a number of years. In such cases seasoning cracking of self-annealing is quite important. Thus it has been possible to make the necessary investigations only in cases where the metal could be kept under observation for a long period of time.

It is a familiar fact that hard-drawn brass wire when held in storage for any considerable length of time shows a decided tendency to lose its hardness or spring temper; and in a few cases where the temperature has been abnormally high these changes have come about in a comparatively short time. In many instances where brass wire has been employed because of its harness or spring temper it became quite useless, though it had not been in actual service but held in storage. In some lines of work where brass springs are used the present tendency is to discard the brass and use steel springs which do not exhibit changes due to age.

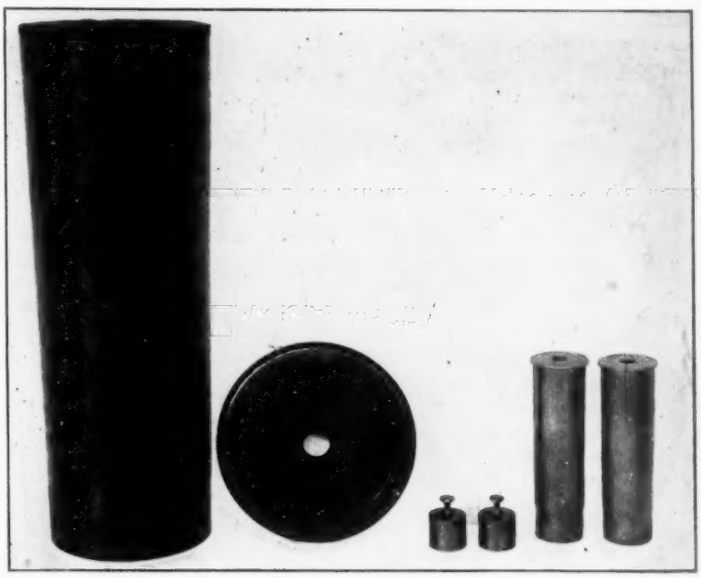
Metallographic methods have not been in use long enough to enable us to ascertain the exact nature of this intercrystalline change; and so far as we know no direct proof is available that recrystallization actually takes place but all evidence points in that direction. The question naturally arises why does not hard-drawn brass show cracks when annealed in the ordinary way. So far as we are able to observe, season cracks begin on the surface and extend inward. Any cracking due to a change in volume would be counteracted by the expansion due to heating.

In rolled brass bars or articles drawn or shaped by spinning or stamping cracks have appeared from causes most mysterious and baffling. Various causes have been suggested as being responsible for the appearance of the cracks. Corrosion has been suggested as a probable cause; but the small amount of energy expended in a slight corrosion would not be sufficient to produce the effect shown in the photographs. Corrosion might be a slight factor in so far as it might weaken some of the overstrained area thus causing the cracks to appear sooner than they would otherwise; but it can not be the primary cause of these cracks. The action of corrosion may be comparable to the weakening effect produced by amalgamation with mercury. Impurities such as lead, cadmium, etc., have been thought to be responsible for this effect from age, but there is no evidence at present which would warrant such belief.

The most probable explanation yet offered of this phenomenon is that when the crystals are broken and distorted resulting in the production of amorphous metal, a slight increase in volume occurs. When the metal attempts to recrystallize or regain its normal condition, the decrease in volume produces a condition of strain, which, unless relieved some other way, produces a break in the metal.

It is not difficult to see that considerable energy must be expended to produce the breaks through such great thickness of metal as shown in the photographs. This must come from internal sources. It is most probable that this energy is stored up in the amorphous material produced at the various slip planes; due to the continued resistance of the crystals to any distortion.

In the manufacture of cartridge cases self-annealing and seasoning cracking must be taken into consideration; as it is necessary ofttimes to store the ammunition for a number of years. Manufacture of such cases as they are needed is not very practicable. Any deterioration due to ageing becomes a matter of the gravest concern.



Large Case, Height 15¼"; Diameter-head 5⅞"; Mouth 4¾"
Small Case, Height 5 5/16"; Diameter-head 1¾"; Mouth 1 7/16"
Weights, Height 15/16"; Diameter 1 1/16"

Since the walls of the cartridge case must be made quite thin, owing to weight requirements, it is necessary to leave them with a hard-drawn temper; as the pressure which they are required to stand is very great. Also the necks must hold very securely the projectiles; and the heads must not allow the primers to loosen. Furthermore, any expansion of the case would likely result in its lodging in the gun. In the case of the machine guns this is most disastrous.

The photographs show some excellent examples of seasoning cracking. The two weights shown are two thousand grain brass weights which have been in the laboratory for about twenty-five years. Each of them is cracked entirely through to the center. These weights have had as good care as any brass article could have. They have been kept in a box with a tight-fitting cover, and removed when in use.

On the right are shown two one-pounder artillery cases made by an outside firm. One case was made in

*A paper presented at the Annual Meeting of the American Institute of Metals, September 11-15, 1916, at Cleveland, Ohio.

1901 and the other in 1902. Each has been used in firing. The cracks have developed since the firing. The history of the cases other than this we do not know. Since time did not permit we have made no attempt to study the conditions which produced these cracks.

The large case on the left is also one of outside manufacture, and shows the case exactly as it was found one year ago. The head had entirely separated and dropped off when moved. This case was never fired nor used in any way but held in storage, protected from all corrosion and weathering influences of any kind. Cases of our own make have shown these same tendencies. A great many cases show only incipient cracks, but these cannot be used.

Cracks as shown in the larger case always appear in the overworked regions which result from the heading operations. The heading operation as is usually done is one which produces the most severe internal strains, more, perhaps, than any other kind of brass working; and cannot well be avoided. The case from the last draw is left with a rounded end and the heads are shaped under pressure. This produces a strained condition entirely around the head and extending from wall to wall, unless special care is exercised to avoid that condition. It is obvious that if these areas are distributed throughout the walls and not allowed to be continuous the metal will have the same strength and the tendency towards cracking will be much reduced. The effect of such distribution is two-fold: first, the strain at any particular point is much lessened; second, should a crack develop, it would be confined to a limited area by softer metal. This we have been able to do by preventing any "folding back" of the metal and properly supporting it from the under side. Thus we have been able, as we believe, to add several years to the usefulness of such cases.

The significance of this problem of season cracking and self-annealing is such that it should receive much serious attention from our best metallurgists. We cannot pass it by without considering it and it is to be hoped that the near future will be productive of much data which will enable users of brass who have difficulties with this problem to more intelligently cope with it. We have no doubt in view of recent investigations but that we will soon know a lot more about it.

CASTING BRASS IN CHILL MOLDS

SOME INTERESTING INFORMATION AS TO MAKING DIE CASTINGS OF A HIGH MELTING POINT MIXTURE.

A PAPER READ BEFORE THE BRITISH FOUNDRYMEN'S ASSOCIATION. BY ALEXANDER HAYES.

Die-casting of certain non-ferrous alloys has long been familiar to foundrymen, the features of this work being the use of alloys of relatively low melting points, and casting under pressure in a special apparatus. The alloys usually so cast are those of lead, tin and antimony in varying proportions, aluminum alloys, and alloys of zinc with from 5 to 75 per cent. of other metals, including copper. As a rule, however, the content of copper in die-cast metals does not exceed 10 per cent., though up to 20 per cent. is present in a few mixtures. The high melting point of copper renders difficult the casting of the alloy when about 10 per cent. is exceeded, owing to the mold being damaged by the heat. The relatively high temperature necessary to melt alloys of a copper content will be readily seen from the following melting points of metals:—

	Deg. C.		Deg. C.
Cobalt	1,490	Magnesium	651
Nickel	1,452	Antimony	630
Iron, cast	1,100 to 1,300	Zinc	419
Manganese	1,225	Lead	327
Copper	1,083	Cadmium	320
Silver	962	Bismuth	270
Aluminum	658	Tin	232

When, however, it is recalled that iron, with a much higher melting point than copper, is regularly cast into permanent molds, it may well be asked why some of the high-copper alloys cannot also be so cast. The reason why copper alloys are not suitable for the usual die-casting apparatus is that the dies in question are made of steel, engraved to give a fine finish to the casting without further treatment. Steel, it is well known, does not stand well against the effects of the continued heating to which casting-machine dies are subjected, and cracking and disintegration take place. Accordingly steel makers prefer suitable cast-iron for ingot molds, as these are found to give a much longer life than steel molds. Steel ingots, of course, subject the molds to a much higher and more prolonged high heat than do non-ferrous alloys in the quantities usually cast. The same defect, however, in a lesser degree militates against the use of alloys of high melting powers in steel dies or moulds.

The mixtures suitable for die-casting which are shown in the accompanying table are quoted from E. F. Lake, an American authority. It will be recognized that none of these alloys has a melting point above 500 degs. C., or thereabout, which temperature is not sufficient to rapidly deteriorate a permanent steel mold or die.

Granted, then, that steel is not satisfactory for high-temperature permanent molds, attention may be turned to cast-iron, which has given satisfactory service as molds for casting iron. The first essential is a low-silicon iron for the mold, to avoid the defect of growth, through oxidation of the silicon and carbon under repeated heating. The mold should then be made as cleanly as possible, and designed so that the casting can leave it freely. An important feature in designing for casting in permanent molds is to prevent the shrinkage of the metal from causing cracks or weak places in the casting. This is not always easy, but often a very slight modification of the details of the design will do much to prevent the trouble. Where dry-sand cores are inserted—these can very well be used in permanent molds when the casting cannot be cored with the die—they should be of light, hard nature, but disintegrate and crush under the heat and pressure of the metal as soon as the latter has just set.

As to the shrikage troubles, however, it should be mentioned that success largely depends on ejecting the castings from the mold at the right moment during cooling. All alloys during cooling after solidification display arrests due to the separation of the constituents or phases, and in the case of iron-carbon alloys this fact allows the casting to be turned out and any solid cores removed before the final contraction comes

on. The arrests in the case of the non-ferrous alloys, with the exception of those containing a considerable amount of antimony, unfortunately are not so prolonged or pronounced (being rather retardations than actual arrests) to allow advantage to be taken of them; they do not take the form of actual expansions as in the case of iron-carbon alloys. Large cores may often be of cast iron, particularly when cylindrical in shape, and may be constructed with a center that can be withdrawn, allowing the core to collapse directly the casting is set.

SOME ALLOYS USED IN DIE-MOULDED CASTINGS.

Kind of Alloy.	Zinc. Per Cent.	Tin. Per Cent.	Lead. Per Cent.	Copper. Per Cent.	Antimony. Per Cent.	Aluminum. Per Cent.
(*a*)	92.6	3.5	..	2	1.5	0.4
	92	..	..	7	1	..
Leddell's	90	..	..	5	..	5
	89	1	..	6	1	3
(*b*)	88.5	..	..	4.5	..	2.5
	88	5.5	..	5	1.5	..
Leddell's	87.5	..	..	6.5	..	6
Shonberg's	87	10	..	3	..	..
Lumen bronze	86	..	..	10	..	4
	85	5	..	5	..	5
Ledebur's	85	..	..	5	10	..
Salge's	84	9.9	1.1	4	1	..
	83	5	..	10	..	2
Stratton's	82	6	10	1.5	0.5	..
Anti-friction (*c*)	82	6.5	6.5	5	..	..
Fenton's	79	14	..	6	1	..
Ledebur's	76	17.5	..	5	1.5	..
	74	15	..	5	..	6
	74	12	..	11	..	3
	73	10	..	5	2	1
High copper	47	31	..	20	..	2
Parson's white bronze (*d*)	38.5	56.5	0.5	2.5	1.5	0.5
Bearing bronze	29	65	..	4.5	1	..
Electrotype	..	3	93	..	4	..
Russian railroad car	..	2	90	..	8	..
Ordinary bearing (*e*)	..	6	87	..	7	..
Jacoby metal	..	5	8	..	10	..
Linotype	..	5	83	..	12	..
Magnolia	..	5	80	..	15	..
Bearing	..	10	80	..	10	..
Railroad bearing	..	10	75	..	15	..
Monotype	..	8	74	..	18	..
Standard white metal	..	5	71	..	24	..
Graphite metal	..	15	68	..	17	..
Bearing	..	10	65	..	25	..
Railroad bearing	..	20	60	..	20	..
Standard type	..	15	58	1	6	..
Hoyle's metal	..	46	42	..	12	..
Italian railroad car	..	37	38	..	25	..

(*a*) High tensile and low ductility.
(*b*) Phosphor-copper, 4.5 per cent.
(*c*) Heavy duty.
(*d*) Analysis.
(*e*) Heavy load.

The early removal of the casting from the mould has the further advantage that the mould is not called upon to conduct away all the heat of the metal. Hence, if a thick mold is used, so as to afford rapid conduct of the heat, it does not become nearly so hot as might be expected. Directly the metal enters, the surface of the casting is slightly chilled and commences to set rapidly, and with the pressure of a good head or riser a dense, strong structure is obtained.

To prevent the molten metal biting into the face of the mold and cores (when metal cores are used) a dressing of plumbago may be applied, and should preferably be rubbed in and polished. If this is done for the first few castings the mold works much better and may serve for several castings on end without redressing. Moreover, the mold works better when well warmed, as, for example, after a couple of castings have been poured.

As an alternative to plumbago, various oils have been tried. The writer does not think the use of oils advisable, owing to the generation of gas under the heat of the metal. A far better effect is obtained by swabbing lightly with crude petroleum or some of the other light hydrocarbons when the mold is hot. The dressing then rapidly volatilizes, but leaves just sufficient deposit on the face of the mold to give a good skin to the casting and prevent the molten metal biting into the iron. The writer has seen this method practised with success. Smoking the molds with burning resin and by other means is, of course, well known in casting copper in permanent molds, and forms another alternative dressing.

Experimenters have frequently been troubled, when casting brass and bronze in permanent molds, with blow-holes and similar defects, apparently caused by gases being forced through the metal. It is found in die-casting that the position of the gate and head has a material influence in preventing or permitting blow-holes. It is impossible to lay down any rule, the matter being best settled by experience and a little experiment. But it is obvious that it is necessary to gate the mold at a point which will drive the air directly out through the joints and vents instead of trapping it. The nature of the dressing of the mold, also, is very important, for if a material is used which generates gas under heat, such as do various oils of animal and vegetable origin, some of the gases in question will almost inevitably be forced through the molten metal and be trapped there. The air in the mold is a far less serious matter, for after all allowance for its expansion under heat has been made, it is still highly compressible and easily forced out of the joints or vents at the rate the pressure of the poured metal comes in. When, however, an oil commences to generate gas in quantities which are relatively large, and this when the molten metal has actually flowed over it, the case is very different, and the gases have to escape through the metal instead of before it.

The ordinary die-casting machine, of course, largely relies on the pressure exerted by the apparatus to eliminate blow-holes and similar defects. The metal, also, is cast direct on to the face of the die, no dressing being used. With simple permanent molds much the same effect is obtained by suitably arranging the gate and giving a sufficient height of head. The size of the gate must be governed chiefly by the nature of the casting and the alloy used, some metals requiring small sprays and others large easy gates which prevent churning of the metal. The height of head, which may take the form of a riser if a deep drop in pouring is to be avoided, governs the pressure exerted on the mold. It should be borne in mind that the diameter of the head is of little consequence; the pressure is not by reason of the deadweight of metal above, but is strictly hydraulic pressure—hence the importance of height. The size of the head should preferably be slightly greater than that of its junction with the casting, in order to retain its fluidity longer; but there is no advantage in pressure gained by a big, low head or riser over a small gate or sprue.

A PLATER'S RECOLLECTION

SOME SERIOUS INFORMATION REGARDING THE FINISHING OF METALS TOLD IN BREEZY STYLE.

WRITTEN FOR THE METAL INDUSTRY BY JOSEPH BIRBAUM.

(Continued from July)

Fritz acted as straw boss over the polishers as he had the reputation of being the best one in the gang, but as a boss he was a farcial scream as it simply was not in him and the less said about it the better for him. Mr. Hoehn placed Joe on the same polishing lathe and under the special tutorship and protectorate of Fritz to learn and absorb the fundamental wisdom of first-class polishing.

"This is the way to do it," said Fritz. "Take some more emery mixed with oil, turn the tubing around like this, now you have got it."

Joe was engaged in brushing brass tubing from which the old nickel was stripped off in an acid dip composed of one quart of water, six pounds of sulphuric acid 66° Be., one and a half pounds of nitric acid 40° Be., and six ounces of saltpeter, mixed carefully and slowly in the order named. This tubing was then brushed on a tampico wheel with oil and emery, buffed and colored up to be replated. There were no suction fans and hoods in existence at that time, so Joe soon had the others beat by getting dirtier than all the rest, but this brushing, which is impracticable, was later replaced by using hard sewed buffs, thereby eliminating one operation. However, today he is using the tampico wheel to produce brush finish work, without previous buffing of the articles and he also makes a cake of from No. 80 to No. 140 emery, according to the coarseness desired, by mixing ½ emery, ¼ tallow and ¼ paraffin. He then lets it cool under pressure and applies this composition to the brush, which produces on stamped or spun articles a pretty and cheap brush finish.

"How are ye getten along, kid? I suppose you don't know what this emery is that is mixed with the stearine oil," said Mr. Hoehn as he inspected Joe's work while on his way to the plating room. "I thought you didn't. Emery is a granular mineral composed of small symmetrically formed crystals. The ore is crushed in mills, thereby reducing it to its component, sharp symmetrical grains. It is a variety of corundum the same as this sapphire in my finger ring, only this sapphire, as well as the ruby, belongs to a nobler variety. Chemically speaking, it is aluminum oxide—$Al_2 O_3$. Asia Minor and the Far East are the principal producers of this ore."

"Do you know what kind of a polishing wheel this is?" said one of the polishers after the foreman had left the room. "That is walrus skin from a rhinocerous. They are shot in the Alps of Switzerland. See this hole in the center of the wheel? That is where the bullet went through."

Congenial Fritz then got sore. "Shut up, Louis, cut out yer foolish babble, ye had calves' brains for breakfast and it's doin' the brain work fer ye. Ye had better not scratch yer head today for ye might get slivers in yer fingers. It's walrus leather, alright 'nough, Joe, and it makes an unexcelled polishing wheel for all purposes, but it's rather costly as some of the hides are over an inch thick and it takes years to properly tan them."

A DAY OF SPEECHES.

"Say, Fritz, this polishing wheel is full of holes all around the polishing surface and kicks like a Missouri mule. Now look, it's rotten all through. Gosh! but this firm got stung when they bought this lot of felt wheels!"

"Yes, it is a rotten wheel, all right enough," said Fritz sarcastically, "but nobody else but you made it so. It's astonishing how quick the platers' supply houses are blamed for everything that goes wrong in the hands of an inexperienced worker. This wheel was bought from a reliable supply house and was O. K., but you spoiled it by improper polishing your work and the wheel got too hot. This formed a combustion under the glue and emery coating and as quick as lightning ate its way practically all the way around. Joe, please exercise a little more care in the future.

Certainly, there are all kinds of felt wheels on the market, but we use only the best white felt, as a cheap wheel wears down much faster, throws out of balance very easy and in the long run is by far not the cheapest. A good felt wheel can be used to advantage for nearly all work, although for some work leather or leather covered wood wheels are better. Canvas wheels are fine, especially for roughing steel and iron castings, but there are no set rules as to what kind of wheels to use. If you will keep your eyes open you will soon learn what particular kind is most suitable for certain work.

Just think, we have only four general classes of polishing wheels; the solid abrasives or enemy; second, carborundum, corundum, etc., which are a solid mass of either natural or artificial aluminum oxides from the arbor's hole to the polishing face; then as I have already told you the felt, next leather or leather covered wood wheels, and fourth, the various kinds of canvas wheels. In the last mentioned class I might include compressed paper wheels. All four classes are again subdivided into different grades, soft, medium and hard, but the solid abrasives are only suitable for grinding, as they do not possess the flexibility of the three other classes.

Now by means of these four general kinds of high rotating wheels thousands and thousands of various articles are polished and it is their pliability that is of pronounced importance. There should be a yielding under pressure, a fraction of a give in it, without losing either its perfect circle, straight polishing surface or the contours of special shaped polishing surfaces. Another important feature is this: the material of these rotary wheels must have the property of readily combining with the glue and holding this glue under pressure and high speed without flaking off. I have heard so many fellows kick about this and that and some always seem to use their ingenuity for finding new excuses after they have turned out a bad job instead of making use of their brains before and at the right time. At times, of course, conditions are not exactly what they should be and it is not a wise owl that compels a workman to work with poor tools, but a good worker can turn out good work even though he uses bad tools. All you can do now is to turn that felt wheel down until you get an even and smooth face on it, then glue-size it and under a slight pressure roll in the desired grain of emery."

Louis, the Dutchman, manifested his approval of

this speech and supported Fritz by remarking, "Ya, ya, Joe, that is right, a good worker never quarrels with his tools."

After this all went along smoothly for quite awhile; only the steady humming and droning of the speeding wheels was heard. Gradually the intermittent chatter of an out-of-balance cotton buff broke in, intermingled by the plain, unpolished, unexpurgated mutterings of the buffer who vainly tried to balance it. But even his fine vocabulary did not help to solve the problem of truing that buff, and then:

"Hey, mein Got shtop that vheel! How you dink I is going to do mine chob vhen this machine kicks like a stonecrusher? For what have we got a vheel balancer, for you to balance your vheel on the polishing machine und tear it all to pieces? No wonder der bearings on this machine don't last. We balance der buffs on a balancer und that makes our polishing machine die of old age und not send them to a young grave by Isaac Cohen's junk yard. Besides, I am piece vork und make no money vhen I got to stand here und watch you try to wreck our machine mit that unbalanced buff."

Louis was the kind of a fellow who had the gift to make and keep friends despite his rough frankness, and his machine partner recognized in the raking down he received the spirit of truth and fairness and so complied with his advice and balanced the buff on the balancer where all wheels, to produce good work and prolong the life of a polishing machine, ought to be balanced.

During this controversy no one in the polishing room had noticed the awful stench arising from the glue pot until the foreman entered and with a roar of a wounded lion jerked the glue pot off the gas burner. "What in blazes is this, a garbage incinerator?" he yelled, thereby rubbing a bad burn on his hand. "Sure, I do not mean myself but the glue. Who set this pot directly on the gas flame?" Joe confessed to being the guilty one and he might as well, as he would have been the goat anyway.

"Well, what a bonehead!" Joe had a hard time suppressing another laugh as he watched the foreman's antics, swinging his arm and dancing a Spanish fandango trying to cool the burned hand.

"So you forgot to set the water jacket up and then tried to hurry the glue along by setting it directly on the gas flame. Well, do not try it again because that glue is absolutely worthless. Sure, go ahead and ditch it. Anyway, it seems to me that you are as yet ignorant as to what glue is composed of and its peculiarities. Glue is an impure gelatine and is prepared from clippings of hides, hoofs and horns. These are steeped in lime water until the hair and blood is removed and then drained and dried in a current of air for some days so that the lime may absorb carbonic acid and thus prevent the injurious effects of the alkali upon the gelatine. They are then boiled in water until the solution is found to gelatinize firmly on cooling, the impurities are allowed to settle and the glue is dried, cut or pressed in forms. When you use glue and want it so that you get the most use out of it, soak it first in equal amounts of cold water until the water is absorbed by the dry glue. After this heat it in a water bath, but do not boil excessively nor burn it on a direct flame as you have just done, as this destroys the plasticity and adhesiveness of glue and causes the flaking off.

"The setting of the glue depends entirely upon the evaporation of the water it contains; therefore, glue kept under a freezing temperature will not set, but neither should you dry any glued article in an excessive heat. Drying properly melted glue under 70 to 80 deg. Fahr. will make it stick and under this temperature it requires about thirty-six hours. A polishing wheel set up under ideal drying conditions possesses an increased efficiency of about twenty per cent. over a wheel which was not given sufficient time to set; say for instance over night, and let me tell you this is a general and bad practice followed in a lot of polishing rooms."

"But does it not take more polishing wheels to keep a polishing room equipped when so many wheels hang idle for drying?" Joe ventured to remark.

"Correct, the first cost of equipment is higher in the reserve than the hand-to-mouth method, but it won't be many days before the price of a good polishing wheel is wasted, then another and so on, and instead for proper equipment good money is spent for bad practices. Besides, did I not just say it takes more improperly set up polishing wheels to do a given amount of work than it does with properly set up wheels? You see there are so many points of support for doing a thing right and none legally for doing it wrong. In my career I have not yet found a manufacturer who would not listen to dollars and cents. Of course, one must be able to back up his words with deeds. Before I get this blooming hand bandaged up I want to tell you that in a large plant you would not have had a chance to burn the glue nor the foreman's hand, for they have one man take care of all wheels. This not only insures uniform wheels but it also keeps the polisher at his machine and increases the machine hour efficiency."

"Mr. Hoehm, is this wheel all right now?" Joe inquired of the foreman after he made his reappearance with his hand all bandaged up.

"Well, you seem to have it balanced all right and it runs noiselessly, but let us give it a close inspection. Yes, ordinarily many polishers would let a wheel of this kind go, but looking closer and using crayon as a marker in that true indicator I had made, I think you will find this wheel will touch the crayon only about two-thirds of its frictional surface. This means that the efficiency of this wheel is cut down about thirty per cent. As this is no trivial matter, but rather one of considerable importance, I want to make this plainer to you. This is a twelve-inch wheel and such a wheel has a circumference of approximately 37¾ inches multiplied by 2,400 which, by the way, is the amount of revolutions this lathe is rated at per minute, is 90,000 inches. Divide 90,000 inches by 12 inches and this wheel ought to produce a frictional field of 7,500 feet per minute or 1⅓ miles. This wheel only delivers ⅔ of its frictional circumference or about 5,000 feet, which equals less than a mile per minute. Where one is resorting to its full hundred per cent. of efficiency the other is using only seventy per cent. Please bear in mind these figures, for in both cases the same expenditure for material was incurred, and also bear in mind that a careless or improper taught worker is therefore in more than one way the cause of unseen loss to his employer.

In this manner many lessons followed. Joe was taught to apply the proper grain of abrasive, the correct way of cross graining the previous abrasive marks, all of which facilitates and expedites first rate work in polishing. He was also taught the proper use of cutting compounds in buffing and that these compounds chiefly consist of minerals containing alumina, iron, silica, carbonaceous matter, etc.

(To be continued.)

EDITORIAL

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THE USE OF SCRAP

There are a number of brass manufacturers in the United States, mostly those new to the business, who have been very much puzzled to know why considerable of the material, principally brass, manufactured for munition purposes has been and is being rejected upon examination by the inspection bureaus. A lot of this material has every appearance of being exactly similar to material that has been accepted and when resort is had to chemical analysis little or no light is thrown upon the problem. Rejected material may have the same component composition as accepted material and still may not come up to physical requirements. It is evident that something more than chemical analysis is needed to exactly determine where the trouble lies. In this connection the microscope operated by an experienced metallurgist plays a most important part. Several cases of trouble with munition material have been brought to our attention recently and in each case the cause of failure was traced by means of the microscope to improper melting methods.

There are two vital factors entering into the use of scrap in the making of munition metal. One is the danger of using too large a percentage of scrap and scrap that has been melted too many times. The second factor is the danger embodied in the use of dirty scrap and in not using sufficient fluxing materials to properly clean the mix. It is a well known fact that metal that has been repeatedly melted will at a certain point in the melting operation lose its "life" although the proper proportions of copper, zinc and other constituents may be present. The judicious use of the microscope will reveal this condition. With new metals at their present high price the tendency is to use as much scrap as possible and the danger point is easily reached if careful microscopical supervision is not exercised. It is a good plan in making the average munition mixture, say of 70 copper and 30 zinc to make a rule not to use over 50 per cent. of scrap that is new and 25 per cent. of scrap that has already had its first remelt. Scrap that has been remelted twice had better be "pigged" and sold as such or used in mixtures not intended for munition metal.

On the second point it is well to remember that the turnings from the munitions shop known as "hay" and usually used as "cabbages" contain a good deal of dirt and this dirt together with the dross naturally formed when the metal is melted is responsible for a large part of the trouble experienced to-day by those who use it. This material should be carefully examined and the amount of dirt noted. A limited amount of such "cabbage" can then be successfully used if proper fluxing is resorted to and this should be done judiciously as fluxes

have a bad effect on the crucible or lining of a furnace. It is much better and safer not to use such material at all in munition mixtures. One of the largest cartridge manufacturing companies in the United States for years used no scrap at all in their mixtures and it is only in recent years that a small amount of the very cleanest available has been used.

It is evident from the above that the question of using scrap, its quantity and quality in munition material is a very important one and one which requires careful supervision by a man who is skilled in the work and who understands thoroughly the value of microscopical examination. This means a metallurgist and not an analyst. Too often we find a chemical laboratory fully equipped with its chemist tucked away in a corner busily engaged in "analyzing" the product. He does not get into the casting shop except perhaps to get samples and sometimes not at all. His reports are sent out and filed away and are valuable only for reference. The proper procedure is for the man responsible for the metal produced to be a metallurgist in the fullest sense of the word and for him to interpret the chemist's reports and govern his product accordingly.

As an illustration of the above we were asked recently to give an opinion as to why a lot of munition brass was going wrong. The metal was being put through the usual processes with no *apparent* cause for suspicion that it would not successfully pass the required inspection and tests. Nevertheless rejections were large and the manufacturers were at their wits' end to know where to locate the trouble. An investigation was made beginning with a close study of the raw material being used. It was found that the method of making up the mixtures was very irregular. One day nearly all new metal would be used and the next a large amount of scrap would be employed. Furthermore, the character of the scrap was not what it should have been. Although it came presumably from the best sheet brass, it had been gathered from several different sources and was very dirty, some of it consisting of sweepings from the floor of a munitions plant. The chemist made analyses from samples chosen at random and the results were averaged! No regard was had as to whether a large or small amount could be used but the caster was sometimes told to use all scrap and at others to use a certain amount of new metal and fill the crucible with scrap! The trouble in this case was eliminated by discontinuing the use of anything that was doubtful and adopting a more uniform method of making up the mixtures. It is needless to state that this concern had no metallurgist and the chemist had only served an apprenticeship of about a year in a brass mill laboratory after leaving college, and in justice to him, he was kept so busy testing raw products that he did not get into the shop at all! Concerns that are equipped with the proper talent to take care of these problems do not have the troubles mentioned and we get no calls for help.

NEW BOOKS

The Mines Handbook—1916 edition, in which is incorporated volume 12 of the Steven's Copper Handbook. Walter Harvey Weed, Editor. Size 6½ by 9 inches. Price $10.00. For sale by THE METAL INDUSTRY.

In 1900 Horace Stevens started the Copper Handbook in which he described all copper mining companies, calling some wildcats, others fakes, and rating meritorious properties as such. Eleven volumes have kept up this policy and given the work an unique fame, for its analysis of each company and for its statistics adopted by the government.

This year the book is enlarged to cover the metal mining industry, and the name altered to the Mines Handbook including the Copper Handbook.

In its enlarged field the book is rewritten and reset from cover to cover. A glossary and mineralogy have been added, new chapters on statistics of price and production of all non-ferrous metals, a list of obsolete securities and a full list of names and addresses of all mining company officials, directors, managers, superintendents, added, followed by a geographical index, showing at a glance all the mining companies of each state.

Hendrick's Commercial Register of the United States. Published by S. E. Hendricks Company. Size 8 by 10½ inches. Bound in cloth. 1,512 pages with index of contents of 149 pages. Price $10.00. For sale by THE METAL INDUSTRY.

The 25th Annual Edition of Hendricks' Commercial Register of the United States for Buyers and Sellers, which has just been issued, rounds out a quarter of a century of usefulness by this standard publication. The work is especially devoted to the interests of the architectural, contracting, electrical, engineering, hardware, iron, mechanical, mill, mining, quarrying, railroad, steel and kindred industries, containing about 350,000 names and addresses, with upward of 45,000 business classifications. Full lists are included of producers, manufacturers, dealers and consumers, listing all products, from the new material to the finished article, together with the concerns handling these products, from the producer to the consumer.

There are 1,512 pages of text matter and the index of contents numbers 149 pages covering over 50,000 trade references. The list of trade names, brands, titles of identifications, etc., is published for the first time and numbers 202 pages. This list furnishes ready reference for purchasing agents and prospective buyers to distinctive products manufactured by firms listed in the work.

Journal of the Institute of Metals. Volume 15, No. 1, 1916. Size 6 x 8½ inches. 392 pages, including index. Bound in cloth. Edited by the Secretary, G. Shaw Scott. Published by the Institute of Metals. Price $5.00.

Corrosion matters dominate the latest issue of the Journal of the Institute of Metals. Perhaps this is as it should be, for, since the last volume appeared, the English government has made a grant equivalent to £1,000 per annum to the institute to carry on research work on this vitally important subject. In the present volume we find the third report to the corrosion committee along with a full and illuminating discussion. In addition there is a description of an ingenious electrolytic method of preventing corrosion, which depends on the application of a counter electro-motive force.

Among the many important papers published in Volume XV are two dealing with aluminum and its alloys, as well as one on "The Annealing of Nickel-Brass" (no longer called German silver), and a fine contribution of a Canadian metallurgist dealing with electric furnaces as applied to non-ferrous metallurgy.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE.

ASSOCIATE EDITORS: JESSE L. JONES, Metallurgical PETER W. BLAIR, Mechanical CHARLES H. PROCTOR, Plating-Chemical

ALLOYING

Q.—Have you any information at present as to certain mixtures for aluminum pistons? Would the presence of iron in aluminum pistons cause it to pit under heat and oil test? What is the best manner to get 2 per cent. of iron into an aluminum alloy Will an aluminum piston with a mixture of 90 per cent. aluminum, 7 per cent. manganese, aluminum, and 3 per cent. copper have any great expansion under heat caused by friction in the engine?

A.—The presence of a small amount of iron in aluminum pistons ought not to cause pitting if it is uniformly distributed and well alloyed. If it is not thoroughly alloyed but is present as "hard spots" it will oxidize under heat and flake off or pit and it will also make the pistons so hard that they can scarcely be machined.

The best way to get 2 per cent. of iron into an aluminum alloy is by means of a rich alloy or hardener of iron and aluminum. Melt together pure aluminum and pure Norway iron clippings in the ratio Al_2 Fe or Al_4 Fe. Add enough of this hardener to give the required 2 per cent. of iron. Allowance should be made for the 0.25 to 0.50 per cent. of iron that is present even in the purest ingot aluminum. It should be remembered that the addition of iron to aluminum raises its melting point and renders it hard and crystalline.

The coefficient of expansion of an alloy composed of 93 per cent. aluminum and 7 per cent. copper between 0 degrees C. and 100 degrees C. is 0.0000240. It is not likely that the coefficient of expansion of the alloy that you name is very different from this but you can have coefficient determined by sending a sample of the alloy to the Bureau of Standards, Washington, D. C.—Bureau of Standards, Washington, D. C.—J. L. J. Problem 2,365.

BABBITTING

Q.—Can you give us a good formula for aluminum genuine babbitt?

A.—A formula for babbitt metal containing aluminum which has given good results consists of the following:

Tin	89
Antimony	7.3
Copper	3.7

With from ¼ to 2½ parts of aluminum.

The genuine babbitt metal mixture consists of 88.9 parts of tin, 7.4 of antimony and 3.7 of copper.—K. Problem 2,366.

COLORING

Q.—I desire to install a coloring plant in connection with my work in gold, silver and bronze. I have had the water analyzed as follows:

	Parts per 100,000
Total solid matter	10,60
Organic and volatile	5,60
Mineral	5,00
Chlorine	0,28
Equivalent to common salt	0,46
Hardness	Medium
Nitrogen—free ammonia	0,004
Albumenoid ammonia	0,010
Nitrates	Trace
Nitrites	Faint trace
Oxygen consumed	0,48

Will you kindly advise me if this water can be used successfully for plating and coloring?

A.—The impurities in the water as per the analysis based upon 100,000 parts will under no circumstances interfere with the color of the deposits. If the solutions are to be comparatively small then distilled water could be used for the purpose. However, the water of the above analysis is amply pure enough for plating and coloring.—C. H. P. Problem 2,367.

LACQUERING

Q.—I am lacquering some small brass punchings by dipping and the lacquer seems to turn green after being used some time. What causes this and how can I overcome this trouble? Could some coloring material be used in the lacquer in order to get the correct tone? The lacquer is contained in a tin receptacle, would the tin have any effect on the lacquer?

A.—Lacquers are mostly all prepared with amyl acetate and the acetate reduces the copper in the brass when used continuously causing the green tone. The only addition that can be made to the lacquer to overcome the green tone would be to procure some gold color from the lacquer concern from which the lacquer was purchased. With a small addition it would change the color from green to yellow.

If the tin receptacle is thoroughly coated with tin no action can take place between the tin and the lacquer. Enameled ware should be given preference, especially white enameled ware, for holding lacquer.—C. H. P. Problem 2,368.

FINISHING

Q.—Kindly advise of the method of obtaining a cloister bronze finish.

A.—The cloister bronze finish can be produced upon either copper or copper plated surfaces. If the articles are of steel with a plain surface, they should be polished with 160 emery, cleansed, copper plated and immersed in a polysulphide or liver of sulphur solution consisting of

Water	1 gallon
Polysulphide or liver of sulphur	1 ounce
Aqua. ammonia	⅛ ounce

Immerse the articles until a very dark bronze is produced, then remove, wash and dry out. Finish by scratching brushing on a worn steel or brass wire brush and then lacquer.

The cloister bronze finish is really a very dark Japanese bronze.—C. H. P. Problem 2,369.

GALVANIZING

Q.—I have been a galvanizing foreman for the past eleven years and have always used aluminum in my kettles for thinning the spelter. Not being able to get bar aluminum, my company has furnished me scrap sheet aluminum. Unfortunately I have lost three kettles in one month's time and am at a loss to know the cause. My company claims it is the aluminum that has burned out the three kettles but I have only been using 1½ lbs. to 2 lbs. daily.

These kettles are heated by natural gas with two long burners on each side. Have suggested a fire clay lining along the sides, but as the gas pressure varies at times fear there will not be enough heat.

A.—The life of a dead soft steel galvanizing kettle is about one year. Where the sides exposed to the fuel are made of Norway or Swedish iron a greater life is obtained. The writer knows of one fourteen foot pot made from one inch thick best charcoal bloom rolled wrought iron of domestic manufacture that lasted four and a half years and was run at night most of the time.

It is true that iron is dissolved by aluminum at high temperatures, but iron kettles are used by most aluminum foundries nevertheless. To avoid the danger of aluminum floating about

on the surface of the spelter for a long time, melt it in a graphite crucible with zinc so as to form a 2 per cent. aluminum, 98 per cent. zinc alloy. This can be cast into thin sticks and added to the galvanizing kettle as needed.

Sheet aluminum is usually very pure and although it may contain 1 or 2 per cent. of manganese there is no reason why it should lessen the life of a kettle if properly used and added as an alloy with zinc.

The loss of the three kettles may have been due to defective steel or to the natural gas. A varying gas pressure may give a local blow pipe action and cause the spelter to eat a hole in the kettles in a very short time. The predicted shortage of natural gas during the coming winter may compel your company to use some other fuel and cause your troubles to cease.—J. L. J. Problem 2,370.

MELTING

Q.—I want to know the formula of a bronze with a melting point under 1,300 degrees Fahr., a tensile strength of 20,000 pounds or more and a good reddish color, also the best method of die casting same. I know that I would have to add some aluminum in order to make the metal flow easily before casting but this is not detrimental.

A.—Red brass has a melting point of about 1,870 degrees Fahr. and the addition of a small amount of aluminum to it would not appreciably lower its melting point.

Manganese bronze has been used more frequently than any other brass or bronze for die casting purposes. It contains a small amount of aluminum and has a golden yellow color when first cast but in time exposure to the air gives it a reddish tint. It has a melting point of 1,660 degrees Fahr. and its tensile strength is much higher than the figures named. Manganese bronze has been die cast successfully both by air and hand machines, but the output of castings possible has been so low that fourth, electro-cleanse and nickel plate.—C. H. P. Problem 2,374.

MIXING

Q.—Can you give me a mixture of bronze for castings to be used in sulphuric acid bath? It must be very tough and be acid-resisting. The casting is a hanger which holds the large box that articles are dipped in and the box is very heavy. A copper, lead and antimony mixture for this is no good as it has no toughness.

A.—Manganese bronze, although it contains a very large amount of zinc, resists sulphuric acid very well. Perforated plates of rolled manganese bronze are used for screening anthracite coal in the Wilkesbarre section of eastern Pennsylvania and they withstand the very acid mine water of this region remarkably well. One inch cubes of rolled and cast manganese bronze showed the following losses in sulphuric acid:

			Rolled.	Cast.
5% acid	(1:20)	for 11 days	.215%	.191%
7% "	(1:16)	" " "	.171%	.175%
9% "	(1:11)	" " "	.166%	.171%
11% "	(1: 9)	" " "	.182%	.175%
5% "	(1:20)	" 142 "	1.72%	1.78%
7% "	(1:16)	" " "	1.76%	2.13%
9% "	(1:11)	" " "	1.57%	1.32%
11% "	(1: 9)	" " "	1.38%	1.70%

A cast manganese bronze frame 3 ft. 6 in. x 10 in. and weighing 800 pounds was used by a galvanizing works in Philadelphia for dipping sheets in acid for a period of three years without showing any appreciable wear.

Manganese bronze is also very tough and has a tensile strength in excess of that of mild steel. It is very fine grained and its ability to resist acids fairly well is no doubt due to this characteristic.—J. L. J. Problem 2,372.

Q.—I am writing to ask if you can recommend an alloy containing about 60 per cent nickel that will produce sound castings. We are making an alloy composed of the following:

Nickel	60 per cent.
Copper	30 per cent.
Zinc	7 per cent.
Malta phosphor tin	3 per cent.

The castings are for seat rings and pistons and although we put large gates and risers on the castings, find that they are porous on the top or cope side. I might add that the castings weigh from one to ten pounds.

A.—It would be better to omit the zinc from this mixture. While the zinc makes the alloy cheaper and whiter, it makes it liable to crack in the mold and give porous castings as it volatilizes readily, even during the setting of the metal. The phosphor tin is added to give good casting qualities, but the amount added should be kept very low.

If the uses to which the alloy is put will admit of using 7 per cent. of tin instead of 7 per cent. of zinc, an alloy that can be handled in a brass foundry may be obtained. The problem is really that of making Monel metal castings as the alloy given is Monel metal to all intents and purposes. The brass founder who is trying to make small Monel metal castings and even the individuals who advertise that they are makers of such castings are usually persons more or less chastened in spirit. However, by using a small crucible and forced draft so as to melt quickly, using a flux of 3 parts of lime to 1 of fluorspar and deoxidizing with 4 oz. of aluminum or 1½ oz. of magnesium to the 100 lbs. of your 60 per cent. nickel alloy, sound castings may be obtained.

One foundry, after trying for some time to make Monel metal valve seats, substituted the following mixture: copper 80, nickel 10, tin 10. They sell these valve seats as Monel metal.—J. L. J. Problem 2,373.

PLATING

Q.—We are nickel plating cast iron hammers for jobbers so they may in turn sell to retail dealers at such a price that they can sell to the public at about ten cents each. For this reason the work must be done very cheap. The method we are at present using is as follows:

First, immerse in electric cleaner; second, pickle for a half hour in a solution of 15 parts water and 1 part hydrofluoric acid in order to remove sand; third, grind on No. 90 solid carborundum wheel; fourth, polish on No. 120 canvas wheel coated with powdered carborundum; fifth, grease on No. 120 grease felt wheel and, sixth, clean in electric cleaner then in cold running water then bright nickel plate for fifteen minutes. The hammers are not buffed after plating.

We find that the above method is too expensive and that we are not able to make any money out of the order.

A.—The method outlined is certainly expensive and would suggest that the following methods be used for producing a cheap nickel finish on the hammers:

First, cleanse from sand with hydrofluoric acid; second, water tumble using silica sand and small proportions of sal soda to prevent the rusting of the hammers when removed from the tumbling barrel; third, polish upon canvas wheels coated with 140 emery or alundums. Oil the wheel and apply tripoli at the same time as this method will give you a better surface in one operation; fourth, electro-cleanse and nickel plate.—C. H. P. Problem 2,374.

SMELTING

Q.—In operating our reverberatory furnace, we have had some difficulty in running down lead drosses as well as electrotype drosses. Please advise what kind of fluxes are advisable in reducing the above material. You might also let us know about stereotype dross as well.

A.—In the smelting of white metal drosses the function of the fluxes is not to reduce the oxides of tin, lead, copper, antimony, etc., to the metallic form, but rather to remove refractory bodies like sand, lime, magnesia, etc., by forming comparatively low melting point, low specific gravity slags. Then the metallic particles which form the bulk of all drosses can coalesce and be tapped from the furnace into ingots. For a reducing agent, hard coal is generally used and its amount will depend on the percentage of oxides in the drosses. Ordinarily, much more coal is used than is really needed. In fact, reduction may be effected by using a reducing flame in firing the furnace. As high as 10 per cent. of hard coal is often used but this high percentage is usually found in furnaces that are run with too great an excess of air.

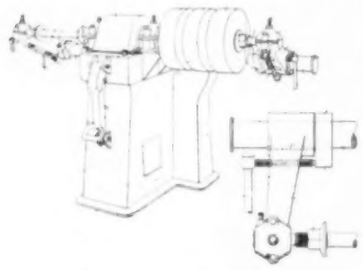
For fluxes acid sodium sulphate or nitre-cake is generally used because of its cheapness, but soda ash, flour-spar, scrap, iron, etc., are also added as the occasion may require.—J. L. J. Problem 2,375.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST.

1,197,006. September 5, 1916. **Buffing Machine.** Robert S. Brown, of New Britain, Conn., assignor to the New Britain Machine Company, of New Britain, Conn., a corporation of Connecticut.

This invention relates to a buffing machine shown in the cut.



One of the principal features of the invention is the provision of means of an effective nature whereby one or more tool members can be readily dismounted and as easily replaced, or one or more of a different nature substituted therefor.

Another important point is the provision of means of a simple kind whereby the functions stated can be accomplished without disturbing the adjustment or adjustments of bearing means.

The patent covers:

In a machine of the class described, the combination of a swinging member, a pivot to which said swinging member is rigidly connected, a shaft supported for rotation by the swinging member and extending outwardly therefrom, a bracket supported by the pivot for lateral and swinging movements, a key for keying the bracket to the pivot, the bracket when moved laterally a distance being freed by the key to permit swinging movement of the bracket and the bracket when in its normal position supporting the extended portion of the shaft, the key acting to limit swinging movement of the bracket when the latter has been moved laterally the requisite distance to permit of said swinging movement.

1,197,616. September 12, 1916. **Plating Ferrous Metals.** Hilliary Eldridge, of New York, N. Y., assignor by mesne assignments, to the Metals Plating Company, a corporation of New Jersey.

The invention relates broadly and generally to new and useful methods for coating or plating ferrous metals with copper, or other non-ferrous metal or metals (that is to say, iron or steel, or alloys whose chief constituent is iron) or alloys thereof, having less affinity for oxygen than ferrous metals, and to new and useful articles of manufacture produced thereby.

If it is desired to coat a body of ferrous metal with a plating of metallic copper, there may be applied to the surface of the ferrous metal, say, sheet-iron, a thin coating of copper oxid, preferably cupric oxid (CuO). Cuprous oxid (Cu_2O) may be used, but it is preferred to use cupric oxid as being cheaper and giving better results. This coating may be applied in a number of ways without departing from the spirit and scope of the invention, but it is preferred to apply it in the form of a mixture of cupric oxid with a suitable liquid vehicle, which may be prepared by mixing equal parts by weight of the cupric oxid and water. This mixture may then be applied to the ferrous body in any suitable way, and as evenly as possible. The ferrous metal coated as above described is then placed in a furnace or muffle, and subjected to a degree of heat sufficient to convert the copper oxid into copper. It has been found that, in order to produce the best results, the temperature to which the coated metal is subjected, in the case of copper, should be at or about the melting point of copper.

1,198,618. September 19, 1916. **Process of Making Brass and Copper Alloys.** G. H. Clamer, Philadelphia, Pa.

The principal object of the present invention is to provide for making brass and copper alloys rapidly and upon a large scale and effecting not only the economies due to operations upon a large scale but also other economies which result from avoidance of waste of material, such as zinc.

The invention can be practised by melting copper in a furnace of relatively large capacity, preferably of the reverberatory type, or the process can be practised by starting with the first melted copper, that is the copper, for example, which is melted from the cathodes. The idea is that a comparatively large amount of copper is melted in a comparatively inexpensive way. For example, the copper can be cheaply melted in a large open hearth furnace and it is to be maintained at the correct "pitch," which means degree of partial oxidation. The melted copper is then drawn off into an electric furnace and zinc and other alloying constituents are added to it and the temperature brought to that proper for casting. The quantity of copper drawn into the electric furnace may be that required and can be comparatively large. The so-called "Herring type of furnace" is well adapted for the purpose of this invention.

1,198,703. September 19, 1916. **Process of Obtaining Adhesive Coatings of Copper Upon Iron and Steel.** Sherard O. Cowper-Coles, Westminster, London, England.

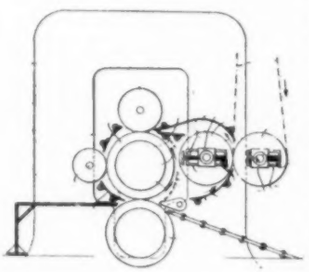
This invention relates to an improved process for obtaining adhesive deposits of copper upon iron and steel.

In describing his invention the inventor says: "According to my invention I obtain an adhesive deposit of copper upon iron or steel by first rendering the surface passive say by subjecting the metal, after it has been cleansed, to the action of concentrated nitric acid, chromic acid, or potassium hydroxid or by making it the anode in a suitable electrolyte or by any other well-known method, the metal so treated being then at once removed to an electro copper depositing tank to receive the desired coating of copper. I have found that copper thus deposited upon the surface of iron or steel, rendered passive by the preliminary action of nitric acid, is so adherent that it cannot be removed by ordinary mechanical means, the two metals being entirely welded together.

"Referring to my use of the term 'passive' it may be stated, that passivity is a phenomenon occurring among certain metals that possess the power of assuming a different state, after certain chemical treatment, their anodic properties being altered."

1,198,741. September 19, 1916. **Rolling Mill for Manufacturing and Dressing or Polishing Sheet Metal.** A. Mäusel, of Maxhütte Haidhof, Germany.

This invention relates to improvements in rolling mills for manufacturing and dressing or polishing sheet metal, and more particularly in the apparatus for feeding the blank from the rear of the roll train to the front side thereof and with its front end between the rolls.

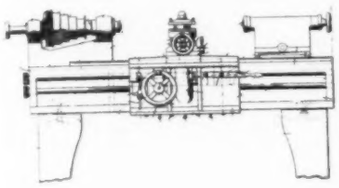


The object of the improvements is to provide an apparatus of this class in which a pair of guide rollers, as shown in cut, are provided one behind the other and at the rear of the rolls, one of which guide rollers is adapted to be shifted toward and away from one of the reducing rolls. Thereby it is possible to guide short blanks between one of the reducing rolls and the adjacent guide roller, and long blanks between the inner and outer guide rollers. Thereby when rolling thin sheet metal or the like of small length the path of the blank when passing from the rear side to the front side

of the reducing rolls is reduced as compared to known constructions. Therefore by means of the improved apparatus blanks of different lengths can be reduced on the same roll train, and the blanks are fed backward to the front side of the roll train along comparatively short paths, so that the economy of the apparatus is high.

1,198,771. September 19, 1916. **Metal-Working Machine.** Edward Rivett, of Hull, Mass.

This invention relates to improvements in metal-working machines generally and the specific embodiment and the general features thereof are disclosed as applied to lathes adapted for accurate work.



The general objects of the invention are to provide a machine of rigid structure, as shown in cut, in which the accurate alinement of the operative parts may be accurately maintained, the wearing away of the relatively movable parts reduced to a minimum and means provided whereby they may be adjusted to compensate for such wear as may take place, to provide means for preventing accident to the relatively movable parts and in the specific embodiment shown herein to provide a machine adapted to perform with increased accuracy a variety of operations such as turning, screw thread cutting, ball turning, taper turning or screw threading, etc.

1,199,200. September 26, 1916. **Alloy.** J. Monville, Hubbell, Mich., assignor of one half to J. J. Ethier and one fourth to Wm. Kline, of the same place.

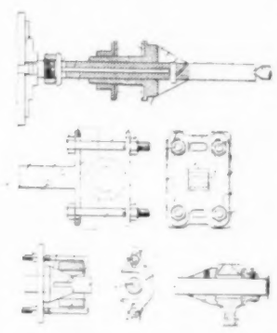
This invention has as its object to provide an alloy which will possess such characteristics as will render it especially valuable in the manufacture of sheathing for the hulls of vessels to prevent the adherence of barnacles thereto and in the manufacture of marine boilers, paddle wheel buckets, piston rods, valve stems, valve seats, valve springs, shell bands, bearings, and in fact any article or machine part where great tensile strength and elasticity is required and for any purposes for which brass is ordinarily employed.

The alloy of the present invention is prepared by mixing and fusing the following metals in the percentages stated:

Copper	95.500%
Iron	3.000%
Tin	.625%
Zinc	.625%
Nickel	.250%

1,200,576. October 10, 1916. **Babbitting Machine.** H. K. Beute, Sedalia, Missouri.

The device forming the subject matter of this application is adapted to be used on a lathe, as shown in cut, for the purpose of babbitting connecting rods and other articles, and for the purpose of reaming out the babbitting after it has been poured into place.



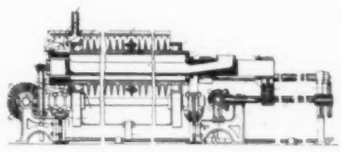
The invention aims to provide novel means for supporting the connecting rod or other article while it is being babbitted and cut.

Another object of the invention is to provide novel means for centering the connecting rod or other article.

It is within the province of the disclosure to improve generally and to enhance the utility of devices of that type to which the present invention appertains.

1,199,353. September 26, 1916. **Machine for Molding Metallic Tubes by Centrifugal Force.** Dimitri Sensaud de Lavaud and Fernando Arens, Jr., of São Paulo, Brazil.

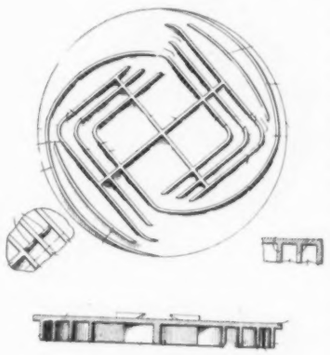
This invention refers to the improvements in machines for molding metallic tubes as herein below described. In the accompanying drawing, a machine, in which the referred-to improvements are embodied, is represented.



The patent covers a centrifugal tube molding machine comprising a rotatable mold for the peripheral surfaces of the tubes to be formed, means for rotating the said mold, means for molding the end faces of the tubes, a longitudinally movable filling trough adapted to extend through the mold in operative position and to be withdrawn completely from one end of the latter into inoperative position, a movable carriage permanently supporting the trough at the last-mentioned end of the mold, means for operating the said carriage toward and away from the mold, means for temporarily supporting the opposite end of the trough when in its operative position, and means for cooling the mold during the molding process.

1,199,742. September 26, 1916. **Polishing Wheel.** Lewis J. Douglass, of Hardwick, Vermont, assignor to M. Wright & Son Company, of Putnamville, Vermont, a firm.

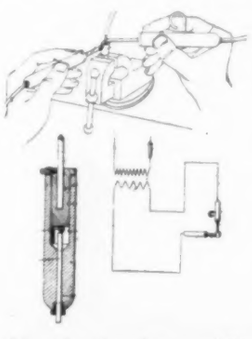
The invention has for an object to effect an improvement in the action of polishing wheels of that type in which a ribbed plate of circular form, as shown in cut, is provided with scroll flanges on the side next the work, between which an abrasive is introduced which is moved about by the flanges and borne thereby against the work. It is the particular aim of this invention to secure a further improvement in the same direction as a former device, wherein the polishing action attained is further increased. This is accomplished with a minimum number of flange elements, which is a distinct advantage, in reducing the quantity of material to be used, minimizing the weight of the wheel, reducing frictional resistance to the driving of the wheel.



The present invention retains the advantages of wheels in which the abrasive is moved toward the center of the wheel, but at the same time maintains a certain amount of the abrasive in the outer parts of the wheel, so that there is no excessive accumulation at the center or near it. There is also a great degree of abrasive action produced in the central part of the wheel.

1,200,810. October 10, 1916. **Soldering Apparatus.** J. G. Clemens, Buffalo, N. Y.

The present invention relates to new and useful improvements in methods of and apparatus for electrical soldering, as shown in cut, the primary object of my invention being the provision of an improved method of soldering in which the current employed passes through the solder being used so that as soon as the solder is removed from the work being operated upon, the circuit will be broken and current thereby saved.



A further object of the invention consists in the provision of a soldering apparatus of such type that the heat electrically developed is developed directly at the part of the metals being soldered, thereby avoiding all waste of energy, due to loss of heat through conduction or radiation.

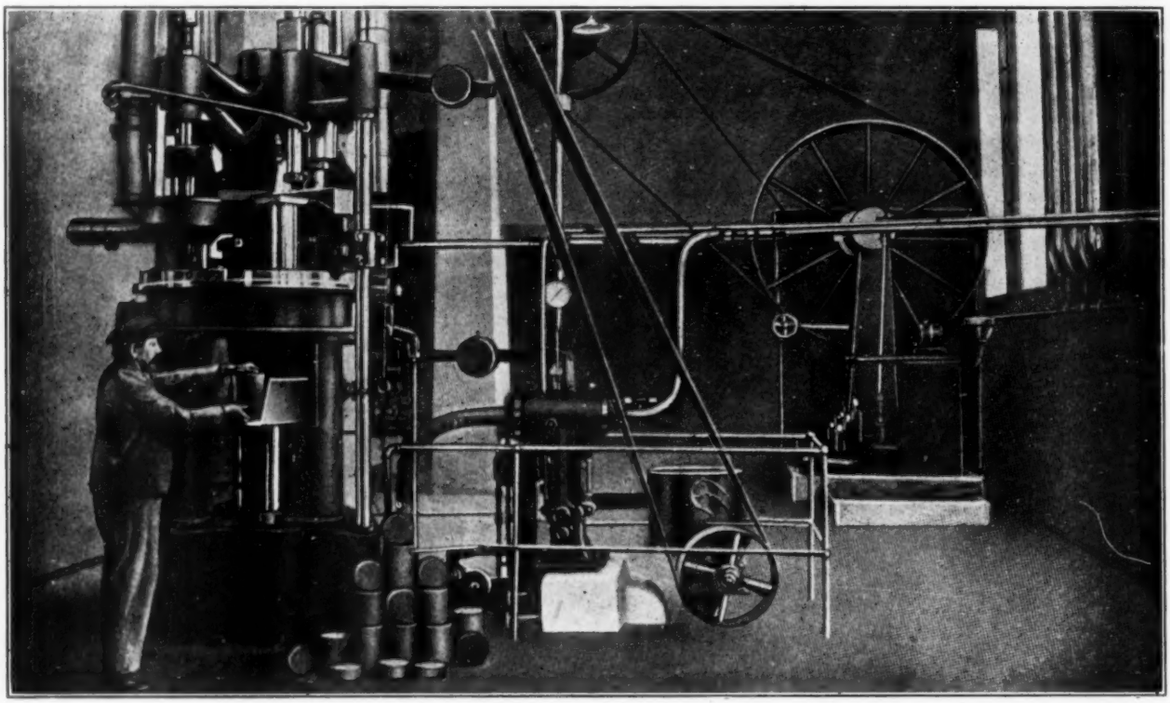
EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST.

BRIQUETTING BRASS SCRAP

Among the features of the present phenomenal rise in labor and raw materials costs, is the very evident determination to cut avoidable losses to the lowest level possible. With an abundance of capital available, installations for recovery of values from what seemed unavoidable waste are springing up everywhere, for it is known that when the slump due on the close of the European war arrives our manufacturing establishments should be prepared.

One of the most interesting developments of special importance to the metal industry is the saving of values by preventing excessive oxidation when melting copper, light brass, bronze, aluminum and other scrap. This is accomplished by subjecting



RONAY BRIQUETTING MACHINE AS INSTALLED AT CHASE METAL WORKS, WATERVILLE, CONN.

this material to enormous pressures and thereby consolidating the innumerable small particles into dense, coherent masses, which melt with almost as little loss as the solid metals. In other words the light scrap is "briquetted."

It is necessary to understand the fundamental action involved when seeking an explanation for the remarkable saving in metal values observed when melting briquettes, as compared with the same material treated the ordinary way. A given quantity of light chips, curls or needles—"hay," as it is oftentimes called—has an enormous surface area when compared with an equal weight of the same alloy or metal when in solid form. In the application of heat during melting in the crucible or on the hearth, the greater the area exposed the greater the oxidation of the metals. Everyone in the business knows this without further proof. If, now, the surface area of a given weight of scrap is reduced to practically the same weight of solid metal, not only will the transmission of heat be better, but the oxidation will be vastly lessened.

In extreme cases, where formerly fully 50 per cent. of the metal was lost in melting, this has been cut down to one tenth by the simple process of briquetting. With heavier chips, and especially the high copper bronzes, this saving is naturally not so marked, for the surface areas, as well as proportions of easily oxidizable ingredients (in the bronzes) is much less.

In briquetting, two important elements are involved—time, and uniformity of penetration on the part of the pressure. The simple hydraulic press alone does not give satisfactory results, unless run very efficiently. If time is given to allow a good penetration of the pressure through the interior of the briquette, the output is small. On the other hand, if the press is run to get a reasonable tonnage the briquettes are worthless. This experience has been obtained by many manufacturers who have tried to utilize their existing plant in this direction. Even with a "floating" mold, the results are little better, for while both ends of the briquette will be sound, the middle portion leaves much to be desired unless the pressure is applied for a long time.

The condition to be reckoned with is the inclusion of air under high compression. The forward thrust of the ram not only forces the material together—dense at the face, and less so further ahead,—but imprisons some air. The pressure has been insufficient to force it out quickly or to interlock the metal particles firmly. The result is often rupture when the briquette is allowed to fall on the ground. Giving the operation time to transmit pressures properly to the end of the briquettes with consequent opportunity for such compressed air to escape, makes just the difference between success and failure. With this in mind, Arpad Ronay, the Hungarian inventor of the most advanced system of briquetting, designed the "stage" compression press, which is operating so successfully in Europe and now also in this country.

From the original "cabbaging" press, which does good work for scrap copper wire—(in which the melting loss is not such a serious question under any conditions)—but at a very low rate

of efficiency, up to the "Ronay" press, which gives good work at a high rate of efficiency, there is every opportunity of losing money in operating the ordinary hydraulic presses. This loss comes from either getting lower melting values through oxidation in poor briquettes, or higher operating cost per ton of briquettes when these are properly made.

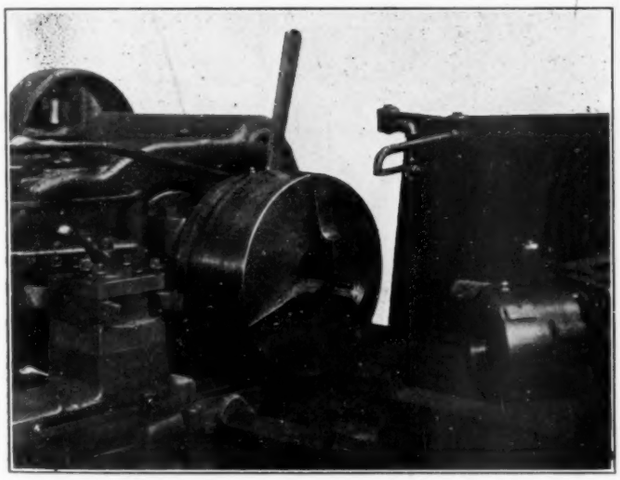
Arpad Ronay conceived the idea of dividing the pressing operation into several stages. In this way he was not only able to compress great quantities at a time (the stroke being short), but having a number of plungers operating at the same time, each one performing a different function in the process, the final briquettes were given sufficient time to come out sound and uniformly dense. A revolving table, the floating mold, an ingenious operating cam, final pressures of some 35,000 lbs. per sq. in., the installation designed to be almost automatic in operation; all combined make a system that is far advanced in the field of high pressure work. The illustration herewith shows such a plant, of which there are twenty-five now in operation in Europe, and the first one for brass in this country just installed and working successfully at the Chase Metal Works, in Waterbury, Conn.

The General Briquetting Company, of 25 Broad St., New York City, has under construction a number of Ronay presses on orders received for this country and abroad, and is actively pushing the Ronay system, which is amply protected by patents. This is in view of the growing demand for better economy in melting the non-ferrous as well as iron and steel borings, turnings, and other form of material now subject to much wastage.

WRENCHLESS CHUCKS

The Barker wrenchless chuck was shown by the Thomas Elevator Company, Chicago, Ill., and the accompanying illustration shows the new embodiment of the chuck.

The operating mechanism of this chuck is in the form of a planetary-gear arrangement all inclosed within a casing which is carried and held central on the hub of the chuck, and is kept from rotating by means of a "U" bar that straddles the headstock or any convenient projection that is fixed solid to the machine. The slot in the casing exposes the outside diameter of the movable internal gear to which the hand lever is fastened. The hand lever movement is imparted from the internal gear through suitable pinions to the cam which in turn actuates the jaws. The same action takes place while the chuck is in motion as well as when at rest.



THE BARKER WRENCHLESS CHUCK.

Since the position of the hand lever is determined entirely by the position of the bar, it is possible to change the angle of the lever merely by fastening the bar around in another position. In most cases and especially for those turret lathes where the carriage passes the headstock and the front of the machine is taken up with control levers the chuck is furnished with the bar fastened so as to throw the lever in about a vertical position. This, however, is entirely optional and can be furnished in any other position that may be specified.

ZINC RECLAIMING PLANT

The photograph shows in an incomplete way the new plant of the New Jersey Chemical Company, 145 Willow street, Trenton, N. J. This company was formed to follow out the invention of a process for recovering zinc from galvanized iron and other zinc bearing materials by Thomas A. Shegog. Mr. Shegog has a patent pending at the present time for recovering zinc oxide and hydrate from waste materials containing zinc and for this reason details of the process are not available at this writing.

Briefly stated the results are obtained by the application of chemical methods and in this way many of the unpromising and unsavory substances formed as by-products in various chemical industries and which were formerly valueless, or worse, are now converted into products which are sources of profit.

The discovery of a process for the recovery and utilization of zinc from galvanized iron, scraps, etc., add a new and interesting chapter of the metal industry. This scrap has hitherto been of no commercial value, since, owing to its coating of zinc, the iron could not be melted up again and remade, as ordinary scrap iron is treated, and consequently it has been thrown on the dumps. By the new process, the zinc coating is removed from the iron (which is thus made saleable as ordinary scrap iron) and after it has been freed from all impurities, it is finally converted into zinc oxide of a high degree of purity. Pure zinc oxide is important to the United States at the present time, as the war has practically cut off the supply of the imported article.

VIEW OF WORKROOM OF N. J. CHEMICAL COMPANY'S PLANT, TRENTON, N. J.

Zinc oxide is used in large quantities in many industries. The potter uses it in his glaze. The rubber manufacturer uses it in the vulcanization of his product. It is also used as a "body" in paint and printers' ink; as a "filler" in paper manufacture, and by pharmacists in making zinc ointment.

The new venture has met with gratifying success thus far, and the owners of the New Jersey Chemical Company will shortly erect special machinery and have the output greatly increased. The company selected Trenton as its place of business because of the large number of potteries and rubber factories and this provides a home market for the product.

RHOTANIUM, A NEW ALLOY

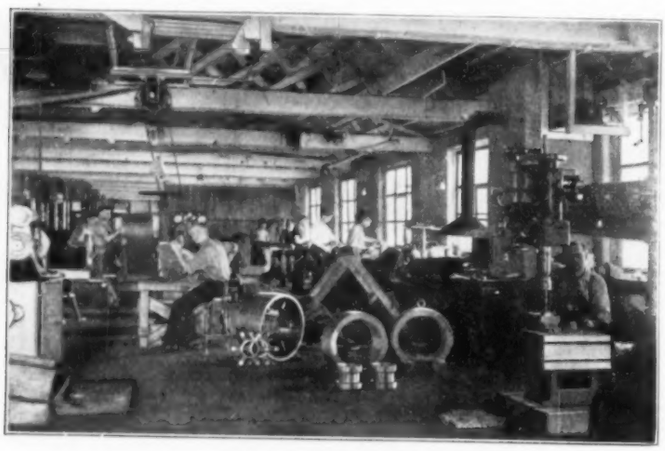
Herman A. Holz, 50 Church street, New York, had on exhibition recently at the National Exposition of Chemical Industries, Grand Central Palace, New York, a new rare metal alloy called rhotanium, possessing similar qualities to platinum. It is claimed that articles made of rhotanium cost approx-

imately 50 per cent. less than if manufactured of platinum, and are superior to platinum with respect to resistance to wear. Some of the uses for which rhotanium is said to be especially adapted are jewelry, laboratory crucibles, dishes, filter cones, tubes, wire, foil, gauze, etc. As a resistance material for use in electric laboratory furnaces, etc., rhotanium permits safe working temperatures up to 1,400 degrees C. or 2,550 degrees F. A great deal of interest has been manifested in this new alloy as regards its use for spark points. For thermo-couples in pyrometers, etc., it is claimed that rhotanium is superior to other materials. New fields for the use of this alloy are constantly developing, and those interested in trying it out can secure samples from Mr. Holz at current market prices.

THE BENNETT-O'CONNELL COMPANY'S TWENTIETH ANNIVERSARY

In April, 1896, the firm of Bennett & O'Connell was formed in Chicago, Ill., the subscribing partners being Martin J. O'Connell and C. D. Bennett. Mr. O'Connell had been connected with the users of plating supplies for 13 years prior to the formation of the company and as his acquaintance with the trade was extensive this contributed largely to the success of the new concern.

In 1909 the present modern factory, as shown in the photographs, was purchased and the business, which had outgrown their former quarters on Clinton street, was moved in. A city salesroom is, however, still maintained on Clinton street for the accommodation of downtown trade.



THE DYNAMO ROOM.

The main office and factory is located in the central manufacturing district. The building is of brick, three stories high, is 225 feet long by 50 feet wide and contains 33,750 square feet of floor space; devoted exclusively to the manufacture of platers and polishers supplies and equipment. The firm has its own private railroad switch running along the south side of the building. Along this switch are five doors; through which five cars can be loaded or unloaded at one time. The freight receiving and shipping facilities are such that no draying is necessary; all shipping and freight receiving is done direct.

THE BALL BEARING LATHE ROOM.

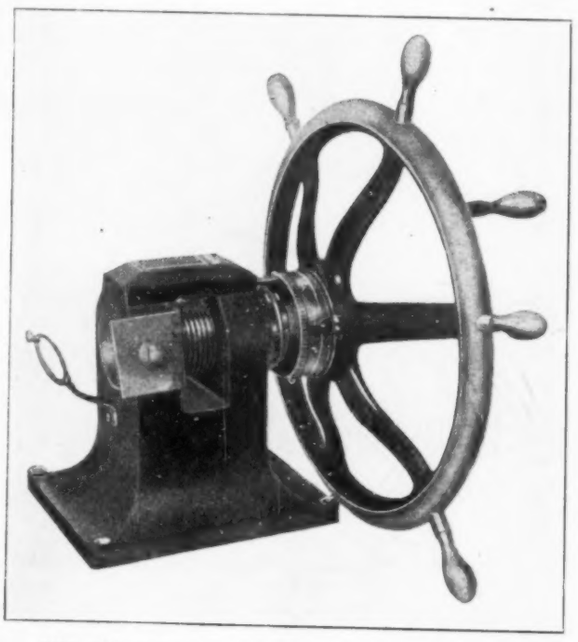
The first floor is devoted entirely to the manufacture of lime, tripoli and emery compositions. This is a busy department, as the company supplies many carload users with their goods. They have adopted "Mascot" as the trade name for their line of buffing and polishing compositions. The most modern machinery is used in mixing the ingredients that go into the "Mascot" line, and the care that insures a uniform product is here everywhere evident.

On the second floor is located the shipping and finished stock departments. The finished goods are here stored in such a manner that no time is lost in picking sizes and qualities in preparing shipments. An experimental department is also located on this floor, in which experiments are conducted and in which the raw material tests are made. Plating and polishing problems are also solved for customers in this department.

The third floor is devoted to the manufacture of dynamos, switchboards, rheostats, ball bearing and ring-oiling polishing lathes, and countershafts, and mechanical plating devices. This department is of considerable interest to visitors, as here are seen equipment in the course of construction for the United States Government, and for shipment to several foreign countries.

METAL SHEET TESTING APPARATUS

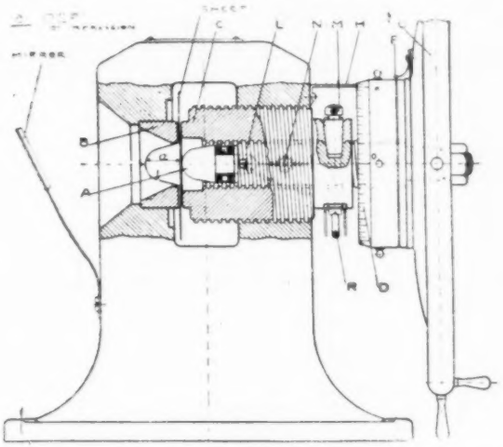
The machine shown in the cut is used in Erichsen's patent process for the rapid and reliable testing of sheet metal. As will be noticed in Fig. 2 a small test piece of material is placed between a die and a holder, as is always the case in ductility tests, the dome being moved gradually forward by a ram actuated by a screw and hand wheel until the fracture of the metal occurs. The test piece may be constantly examined during the testing process by means of a mirror suitably situated. This enables the moment of fracture to be ascertained to a great nicety. The drawing value of the test piece may be read off on the apparatus and is the scale by which the quality of the metal sheet may be determined.



THE ERICHSEN SHEET METAL TESTING MACHINE.

The advantage of the new method of testing lies, first of all, in the possibility of obtaining actual testing figures in a few mo-

ments without any previous preparation of the test piece. It is therefore possible to test, in a very short time, quite a great number of different qualities of sheet or strip metal, thus providing an effective means of control with satisfactory results both for the manufacturer and the buyer of the metal sheet.



PLAN VIEW OF THE ERICHSEN SHEET METAL TESTING MACHINE.

As all the apparatus is adjusted in exactly the same manner, and the parts made to the same precision gauges, the results obtained from all apparatus when testing homogeneous material, will have the same drawing value. It is therefore quite easy to set up certain standards regarding the quality of sheet required for a certain apparatus by simply stating the required minimum drawing value.

The manipulation of the apparatus is so simple that any workman is able to operate it without any previous experience.

Standard of depths of impressions for good qualities of various metals in sheets of about 0.4 mm (1/64 inch) in thickness, soft annealed are as follows:

	Depth.	Inch.
Brass stamping sheet	13.5 mm	0.532
Yellow	11.7 mm	0.461
Pure nickel	11.5 mm	0.453
German silver stamping sheet	11.5 mm	0.453
A 1 German silver sheet	11. mm	0.433
Copper sheet	10.5 mm	0.413
Aluminum sheet	8.7 mm	0.343
Zinc sheet	6.5 mm	0.256
Silver sheet 875/1000	7.5 mm	0.295

This apparatus can also be used for the testing of tubes by cutting the tubes down and carefully straightening them out with a mallet. Further information relating to this machine may be had by corresponding with A. M. Erichsen, 120 Broadway, New York.

CELLULOID ZAPON COMPANY'S EXHIBIT

The accompanying picture shows the attractive manner in which the Celluloid Zapon Company, of New York, N. Y., specialists in Zapon and Zapon enamels, displayed its products at the Chemical Exposition held the week of September 25 at the Grand Central Palace, New York, N. Y. In view of the fact that compounds used in the manufacture of high explosives are so much in demand at the present time, it was but natural that the samples of gun cotton and solutions should be the prominent feature of the exhibit, although their ultimate design was for use in peaceful ways rather than for warfare, i. e., the manufacture of lacquers and enamels.

These samples were so arranged that it was very easy to trace each step in the making of Zapon and Zapon enamels and give one a very good idea of the difference in the appearance of such solutions made for different purposes.

Many samples finished with Zapon were shown. These consisted of builders' hardware, portable electric lights, metal novelties, buttons, dolls and celluloid novelties. Perhaps the one thing of greatest interest to the electro-plater and metal worker was a sample board of 42 brass shells finished in as many different finishes. These were loaned by a prominent chandelier house in the city and represented their standard finishes. Nearly all of these were finished with Zapon enamel—all with transparent Zapon. Almost every finish, from old brass to the browns and greens so popular now, was represented.

CELLULOID ZAPON COMPANY'S BOOTH AT THE CHEMICAL EXPOSITION, NEW YORK, SEPTEMBER 20-24, 1916.

This company, by means of Zapon, has been instrumental in helping the metal manufacturers to solve some of their finishing problems and to make their articles attractive to the buying public. How well they have succeeded was shown by this exhibit and the great interest it created.

To aid them in perfecting their service to customers the company maintains branches at 406 South Main Street, Los Angeles, Cal., and at La Salle and 45th Streets, Chicago, Ill., the latter in charge of Frank P. Davis, formerly connected with the New York office.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS.

AMERICAN ELECTRO-PLATERS SOCIETY

Philadelphia Branch—Philip Uhl, 2432 North 29th street, Philadelphia, Pa., secretary.

The regular monthly meeting of this branch was held on October 6, at which time a general discussion was had on the nickel plating of tin. This subject will be further discussed at the November meeting, at which time Dr. Lukesn, of the University of Pennsylvania, will give a talk.

St. Louis Branch—F. C. Rushton, 4405 Blair avenue, St. Louis, Mo., secretary.

The October meeting of the St. Louis branch was held Saturday evening, October 21, in the assembly room of the St. Louis Public Library. An interesting paper in chart form was presented by G. S. Robins, showing the action of acids and alkalies on metals, and which proved to be not only interesting, but instructive. The rest of the evening was spent in a lively discussion of a question which was brought up: "What effect does sulphuric acid have on a nickel solution?"

New York Branch—President, H. H. Reama; Secretary, Frederick Haushalter, 82 Hull Street, Brooklyn, N. Y.

The meetings of this branch were held on October 8 and 27 and were well attended as great interest is being shown by the members in the work of the laboratory committee. This committee has sent to each member of the New York Branch and to members of other branches a list of questions as follows: What is the best method of nickel plating tin, iron, steel and die castings and the best method for striping the same? What is the best method for nickel and silver plating direct on bright aluminum? What causes blistering in a cyanide copper bath when plating on steel, iron and britannia, etc.? What causes the dull and bright streaking and smutting on cyanide copper plated work and what is the best method of getting a black surface on brass by a dip? One of these questions will be taken up at each meeting so that the members will have a chance to have an intelligent discussion on them.

Toledo Branch—James E. Nagle, 209 Navarre avenue, Toledo, Ohio, secretary.

The regular meeting of this branch was held on Tuesday, October 24, at the Toledo University. After the regular business the members took up the analysis of cyanide copper solution, the completion of which was postponed until the next meeting as the standard solutions for volumetric work had to be made up.

Providence Branch—Alfred Senecal, president, and Albert J. Lemrise, 124 Waverly street, Providence, R. I., secretary.

The open meeting, which was held by this branch on October 7, was opened by President Senecal who welcomed the members and visitors present. John T. McDonough, chairman of the occasion, then introduced Charles H. Proctor, who gave an address on the benefits of the society. After Mr. Proctor a letter from Supreme President H. H. Williams was read, after which George B. Hogaboom gave an interesting talk. Messrs. Flannigan, Stevenson, Dittmar and Schneider, of the New York Branch, and Mr. MacDermid, of the Bridgeport Branch, were also called upon for a few remarks. Messrs. Proctor, Hogaboom and Flannigan were made honorary members of the branch. After the meeting adjourned the visitors, accompanied by the members of the branch, were entertained at a dinner at the Crown Hotel.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST.

William Flaster has accepted a position as foreman annealer at Mill No. 2 of the Stamford Rolling Mill Company, Stamford, Conn.

A. C. Sickles has become connected as assistant superintendent of the casting department of the Brown's Copper & Brass Rolling Mills, of New Toronto, Ontario, Canada.

William A. Leigh, superintendent of the Metal Products Corporation, Providence, R. I., for the past ten years, has resigned to take a similar position with the Metallic Shell & Tube Company, East Providence, R. I.

George P. Bangs, formerly superintendent of the casting shop of the National Brass & Copper Company, Hastings-on-Hudson, N. Y., is now metallurgist for the Wheeler Condenser Company, Carteret, N. J.

W. R. Dean, formerly metallurgist for the Hyde Windlass Company, Bath, Maine, is now metallurgist for the Neptune Meter Company at Long Island City, N. Y. Mr. Dean, it will be remembered, is one of the authors of THE METAL INDUSTRY, his specialty being foundry problems.

Richard Zilberman, formerly connected with the Capitol City Plating Works, Albany, N. Y., has become sole proprietor of the Schenectady Polishing & Plating Works, 553 South Centre street, Schenectady. Besides plating and polishing of all kinds, Mr. Zilberman will also make a specialty of resilvering mirrors.

David Burgess, formerly a resident of Connecticut, is now general superintendent of the Michigan Copper & Brass Company, Detroit, Mich., taking the place of Benjamin F. Brusstar who resigned last Summer. The rest of the officers of the company are David M. Ireland, president; James E. Danaher, 1st vice-president; Fred T. Moran, 2nd vice-president; Alfred L. Simmons, secretary; John L. Connell, treasurer. The mill reports that its products are sold out for the next six months.

DEATH

WILLIAM COOPER CUNTZ

William Cooper Cuntz, managing director of the Goldschmidt Thermit Company, of 120 Broadway, died November 2 at Auburndale, Mass., in his forty-fifth year. He was born and educated in Hoboken, graduating from Stevens Institute of Technology, and started his business career with the Pennsylvania Steel Company, of Stockton, Pa., and later went to Boston, Philadelphia, and London, England, for the company. He became connected with the Goldschmidt Thermit Company in 1910. Mr. Cuntz was a member of the American Society of Civil Engineers, Engineers' Club, Chemists' Club, University Club of Philadelphia, and many other associations.

He leaves a widow, who was Miss Catherine Hughes Edwards, of Hagerstown, Md., and two sons, William Cooper, Jr., and Emil Edwards. His home was at Kew Gardens, Queens.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS.

WATERBURY, CONN.

NOVEMBER 6, 1916.

Conditions throughout the Naugatuck valley in the brass and copper industries are still flourishing at such height that the local democratic politicians are actually making votes on the strength of the industrial situation. Jobs are plentiful, they say, wages high, work easy, times best ever. Vote for Wilson! And right here in Waterbury there are some warm arguments among the workers in the great factories as to whether or not they ought to vote for Wilson or Hughes, with the result that the local democratic prophets have the local republican prophets guessing. The democrats think the election will go with them, but the republicans do not concede it.

"E. O. Goss is going to vote for Wilson," was one of the democratic reports put out a day or two ago, and it actually caused some guessing in both democratic and republican ranks. Mr. Goss was interviewed. "I feel very much hurt that anyone should spread a report that I am such a fool," was his comment, added to the statement that the report was absolutely unfounded. Mr. Goss is general manager of the Scovill Manufacturing Company.

Waterbury factory owners and workers are not forgetful of the miserable months that followed so soon after the Underwood tariff law went into effect, when their factories were stopped after a pleasant period of full time, or near it, lasting many months. Orders slowed down, then stopped, and finally salesmen were called home, extra hands laid off, and so on down the line until minimum forces were the rule in almost every plant, and orders were seized upon and filled with enthusiastic fervor lest a customer would go elsewhere. Even eight months after the war had broken out and started an unprecedented demand for materials of the kind made here for use in the production of munitions, normal business was at the lowest point it had ever reached, as readers of THE METAL INDUSTRY were informed then, and it was a full year after the war had started before the scars made by the Underwood tariff's operation began to fade. That makes the older residents and the hands that have long been employed in Naugatuck valley factories hesitate to concede the democratic campaigners' claims.

But aside from politics, business is going along smoothly, with the great plants of the American Brass Company, the Scovill Manufacturing Company, the Chase Metal Works, the Waterbury Manufacturing Company all operating twenty-four hours a day and turning out the utmost of their capacity. They have use for all the help they can get, and they are so well loaded with orders that the end of this schedule is not in sight, at least from any point outside of the innermost offices.

Extension of plants goes forward steadily, and despite the delays and difficulties caused by shortage of certain materials and lack of greater transportation facilities, the increase of floor space and the accumulation of fine new modern factory buildings is most remarkable. It seems as if every bit of idle ground had been suddenly found fertile and cultivated to produce another handsome steel and concrete structure with saw-tooth roof and every modern device for efficient production. The extent of the American Brass Company's work in this direction does not impress the visitor or the Waterburian quite so much as the evidence of activity about the plants of the Scovill and the Chase concerns, but it may be said without exaggeration that the additions to the plants of the American Brass Company since the beginning of the war have been greater than those of the other two concerns combined, great as these are, and still it goes on. Waterville is no longer a fringe of workingmen cottages and little factories. The Chase Metal Works is growing rapidly and all around homes and stores are sprouting and the suburbs of the city are already straggling into the town of Thomaston, seven miles to the north. On the eastern end the Scovill Manufacturing Company is doing its best to fill up the white spots on the map of the city. Its factories are extending and crowding even the cemeteries that were considered the outer limits of the city, while new streets and new residential settlements are extending with the factories. The Waterbury Farrel Foundry and Machine Company, Plume & Atwood Company and others are also extending considerably.

In the matter of meeting the social problem made acute by this wonderful development, the Waterbury manufacturers have taken a most progressive attitude and are now promoting the erection of model homes for their employes, which will be rented or sold to them on approved plans. John Nolen, the Cambridge expert on city planning, has been their principal counsellor in the matter and they are following many of his suggestions, after a thorough survey of the local conditions.

Some of these dwellings will be ready for occupation before winter. Others will be ready early next year, and many will be completed before spring.

One condition that is beginning to be troublesome hereabouts is the high price of coal. Premium prices have been paid for prompt deliveries by some of the largest factories in the valley and there is still much cause for speculation. Coal dealers seem to have underestimated the true state of affairs as regards labor and transportation, and manufacturers are no longer taking chances; they are buying where they can get coal with assurance that it will be delivered promptly, and those who have stocked up for the winter are being congratulated.

In munitions plants there are no complaints about business, domestic orders being large enough in view of the crush of business in munitions orders. In plants that are not making brass and copper wares for munitions there are few complaints, but some tall thinking. It is noticeable that orders are not renewed with the zeal that appeared a year ago, and the deduction is that the consumption of goods is hardly any larger than a year, or two, or three years ago. For instance, those who bought in a six months' or a year's supply, last fall, to take advantage of the rising prices, are not coming back promptly, indicating that they have plenty of goods on hand. Renewals are not very tardy, but the indications are that business is hardly above normal in most lines depending on domestic consumption.

Watches and clocks are not over lively, despite the conversion of so many watch plants in other centers into munitions plants, but the trade is not discouraging.

One of the interesting recent announcements was that the Chase interests would soon begin the erection of a fine office building on the Grand street site, opposite the new Municipal building, occupying the entire front between Church and Leavenworth streets.

Both in September and October the Scovill company declared extra dividends of ten per cent., and there are growing demands for this and other local stocks. Scovill stock is selling at from 735 to 750, and American Brass Company stock has jumped recently to 380.—T. F. T.

BRIDGEPORT

NOVEMBER 6, 1916.

As the world in general knows, and the manufacturing world in particular, business in Bridgeport has been and is booming in a way that is without parallel in the United States. It can truthfully be said that all of the shops and factories in the city are working to their fullest capacity, some of them running as many as two and three shifts.

Needless to say, the various arms and ammunition companies located in this city have all they can do, and more. The Remington Arms and Ammunition Company, employing thousands of men, is running at full blast all of the time, contrary to a lot of wide-spread rumors that frequently appear regarding the ultimate collapse of this company.

Labor conditions in the city are not all that they could be, due to the fact that there are more jobs than there are men to fill them. One of the managers of a large concern here stated recently that before the "war boom" struck Bridgeport you could not drive men away from his shop with a club, but in these later days they leave on the slightest excuse, knowing that they need not lose a minute before getting another position. One of the bad effects of these too-numerous jobs, is that unskilled men are being hired at the various shops and factories, and being paid the wages of men who are skilled mechanics. This tends, as always, to create unrest and discontent among the skilled workers, with the result that there have been several strikes and walk-outs in the past few months. Most, if not all, of these have been settled now, however, and the shops are again running at their usual pace.

One of the obstacles in the way of securing enough men in Bridgeport has been the poor housing accommodations offered men coming here to work. The city has increased approximately 50 per cent. in the last three years and until recently there was made no added provision for this sudden influx of workmen and their families. In the past few months, a company has been incorporated, called the Bridgeport Housing Company, which aims to alleviate this condition of affairs. This company is composed of different residents of the city, some of them interested in the factories, and some who are not. The object of the company is to build separate houses and apartments in an up-to-date manner which will provide homes for the workmen and their families, and be an added inducement to make Bridgeport their permanent home. Work is also being pushed by several of the factories in the city on model apartments for their employees, in which they are able to live more comfortably and cheaper than they would in their own, or rented homes. It may confidently be said that the beginning of the year will see the new housing plans in Bridgeport well on their way to completion.

The Bridgeport Brass Company reports that they are very busy, having all the orders that they can handle. As with most of the local companies, the war has added to their business rather than decreasing it. Quite a lot of war material is turned out by this company in addition to their regular line of work.

The Artistic Bronze Company reports that things are also booming with them, business coming in just about as fast as they are able to handle it. They state that they are able to secure men although it is necessary to pay a great deal higher rate than was necessary before the war.

The Monumental Bronze Company, manufacturing a wide variety of bronze pieces, are once again regaining their normal stride. They had labor troubles recently, but these have all been ironed out and things have resumed their normal aspect. In conjunction with the other factories in the city, they are also filling some war orders.

Holmes & Edwards, silver platers, are very busy, in spite of the fact that none of the war business comes their way. It might be well to note that this is in direct contradiction to the statement often made, that Bridgeport relies on war orders only for its support. While it is true that many of the shops in the city fill war orders, it is nevertheless true that those shops who take no part in this are equally busy.—L. M. P.

NEW BRITAIN, CONN.

November 6, 1916.

With the rapid approach of winter, local manufacturers are again sitting back complacently in their chairs, all fear of a strike scare gone. Not that a strike was seriously contemplated, but with the conditions of just a year ago in mind those at the head of the big concerns could not help but have some misgivings. But labor conditions are continuing to improve here and even the coming presidential election, with the Republicans again preaching a high protective tariff, has failed to affect the factories. Every local concern is working a full schedule of hours, and indications are that the same conditions will continue throughout the winter. Some of the manufacturers, however, are looking somewhat timorously towards the ultimate conclusion of the European war in the event of another Democratic administration. As with all northern concerns, they feel hat their very existence depends on the high protective tariff, and point out that during the first year of the Wilson administration, before the European war brought enriching war orders to them, the revised tariff worked havoc with them. During those first few months of the administration, immediately following the tariff readjustments, business took a most pronounced slump. Almost every factory went into short time and some departments even ceased operations entirely. This was due, the manufacturers declared, to the great influx of cheap, foreign-made goods. Thus, with conditions at present excellent but on the eve of a great national election, do many of the leading manufacturing men of New Britain view the situation.

Today, however, there is not a single local concern that is not going at top speed in an attempt to keep abreast of its orders and to keep the stock bins in the store houses filled. The approach of the Christmas holidays and the consequent heavy Christmas trade is already being felt at two local concerns, the Landers, Frary & Clark Company and the Traut & Hine Manufacturing Company. Both concerns are rushed with orders. At the former all sorts of domestic articles, such as bread mixers, coffee percolators and cutlery of every description are made. At the latter concern an enormous business is done in the manufacture of buckles, particularly the variety used in the making of suspenders, hose supporters, etc. Several additions have recently been completed at the Landers, Frary & Clark factory, and some new ones are being contemplated. This concern has also recently purchased a large tract of land which it may utilize at some future date for factory purposes.

The Fafnir Bearing Company, one of the younger but very important concerns, is bustling with activity. This company makes bearings of all sorts, and the boom of the automobile business has spelled success for them. The Hart & Hutchinson Manufacturing Company, where pressed steel lockers are made, is daily turning out a large number of completed products and has ample orders on hand. The various branches of the American Hardware Corporation, comprising the P. & F. Corbin division, the Russel & Erwin division, the Corbin Screw Corporation division and the Corbin Cabinet Lock division is also going at top speed. This corporation also has some valuable war orders which have increased its volume of business. The fact that the value of the stock has increased from about $118 per share to about $136 per share in a few months shows the business that is being taken care of.—H. R. J.

PROVIDENCE, R. I.

November 6, 1916.

The mad rush of business in the mills and factories of every line throughout the state continues, despite the political campaign and all other issues that have come up. And withal the metal workers are the leaders in the state's industrial prosperity, as has been the case for many months past. Orders are reported to be coming in in such large numbers that the manufacturers are picking and choosing the business that is being offered, taking the cream and refusing all the rest. Many of the plants are reported to be sold up for the greater portion of next year and nearly all of the plants are able to operate close to 100 per cent of the machinery due to the additional help that it has been possible to secure within the last few weeks.

The supply of help is a little better than it has been for several months past but there is still a heavy demand for skilled help, the larger number of new workers being unskilled. The munition factories continue to secure the best of the available supply of help, because of the high wages and the bonus system that is in force, which results in at least an extra week's wages every month. In this city and vicinity all lines of manufactories are now confronted by a coal famine and even such tonnage as can be secured is double or more than the prices of a year ago. None of the coal agencies here are booking any contracts at any price on either hard or soft coal.

As has been the case for the past two months, the jewelry manufacturers are rushed with work, and are clamoring for help. Prices for the materials are unusually high, but the conditions of trade throughout the country are such the the manufacturers are said to be making more money than for several years past. All kinds of jewelry is in demand, including many of the older staple lines, it is reported.

The Gorham Manufacturing Company, whose preferred stock is so tightly held by fortunate owners now, made a clear profit of more than $630,000 in the past year, according to reports in financial circles, and is earning even better than that this year.

The Wilprett & Saacke Company, manufacturing jewelers of this city, have just installed a Boland exhaust and dry dust collecting system. Boland sand blast systems are being installed by H. J. Astle & Company for the Greenfield Tap & Die Corporation of Greenfield, Mass., and for the Pittsburgh Hickson Company of Novine, Pa. The company has recently made a large shipment of Boland systems to the H. & A. Saunders Company, Toronto, Can.

A. Holt & Company, one of the oldest manufacturers of gold and silver plate stock in the city, has been incorporated under the style of A. Holt & Company, Inc., and will continue the business at 167 Dorrance street. The incorporators are Frederick J. Holt, a son of the founder of the concern, who has been elected president and general manager; Frank Cutter, who becomes secretary-treasurer of the new corporation, and J. Flannigan, all of this city. The business was established about 50 years ago by the late Albert Holt.

The American Screw Company is making extensive alterations, repairs and additions to its five-story brick manufacturing building on Stevens street.

H. L. Graham & Sons have removed from 27 North Union street, Pawtucket, where they have been located for a quarter of a century, to new and larger quarters, 66 Exchange street.—W. H. M.

BUFFALO, N. Y.

NOVEMBER 6, 1916.

Buffalo factories using brass and copper are feeling seriously the shortage in crucibles, which are made of German clay and lead. The price has advanced from 4½ cents a number of three years ago to from 15 to 30 cents a number now, and they are hard to get at that. The Unique Brass Foundry Company reports that it is borrowing all the crucibles it can, to keep from shutting down, and that while it is doing a heavy business, there is not the profit in it that might be expected. The manufacturers of crucibles are said to be making them, but they do not last. The Unique Company put in an order recently for 50, but only six were delivered. This concern is reported to have paid $12 recently for an old crucible that ordinarily it would not have paid five cents for.

Brass foundries are said to be putting in non-crucible furnaces, but the Unique has not done so yet. The National Bronze Foundry is considering a change. The Schnell Bronze Bearing Company is doing a fair volume of trade on orders, and contemplating a contract for between three and four tons.

The Lumen Bearing Company abandoned its crucible furnaces several weeks ago, and is now using exclusively the direct flame furnace, except that it has installed a Bailey electric furnace made in Lyons, O. The electric furnace is being tried out in the Lumen plant on an agreement between the manufacturers and the Buffalo concern, and a hope has been expressed that it will prove to be more efficient than either the direct (gas) flame or the crucible furnace process.

Plating concerns in Buffalo report steady business for the fall. The Washington Plating Works reports feeling the shortage in supplies, notably cyanide of potassium, but so far has not been compelled to slacken operations on that account. Stove plating is a principal item of activity at this season.

The A. G. Fries Plating Company secured a contract on October 24 for 140 tons of galvanizing, an out-of-town job that will keep this concern busy for a year, running at present capacity, without putting on a night shift, although it expects to do this before the winter is over.

The George A. Ray Manufacturing Company is fully occupied on old and new orders, particularly now on coffee urns and steam tables for restaurants and hotels.

The Buffalo Enameling & Nickel Plating Works, which discontinued the nickel plating end of the business when it moved several years ago from 386 Ellicott street to 405 Elm street, is doing a rush enameling business, principally on bicycles.—R. E. D.

DETROIT, MICH.

NOVEMBER 6, 1916.

Considerable anxiety is expressed among the brass, copper and aluminum manufacturers and dealers as to the coal shortage that appears iminent. At present the supply is only a hand-to-mouth proposition, and dealers will not make contracts for delivery at any definite price two days ahead. If the supply becomes much shorter manufacturers are unable to say what the result will be. The metal industry manufacturers are all feeling the high cost of products. Copper is high, coal is high, labor is high, and producers in their perplexities say the only things they find that show no change are sunlight and water.

Practically no labor disturbance of consequence in the brass copper and aluminum field here has developed for several months. High wages are being paid; in fact manufacturers are forced to, as the automobile companies, which have set a high standard, will grab off the men at every opportunity to secure a good mechanic.

At this time of the year the automobile companies, which use great quantities of brass and aluminum, are usually closing down in preparation for the spring campaign. This year, however, practically every plant in the city is working to its utmost. The accessory plants report the same active condition.

It is announced that a new automobile company has been organized in the East under the style of the Harroun Motor Company, and a plant is soon to be constructed at Wayne, Mich., a suburb of Detroit. The company is incorporated for upwards of $1,000,000, the stock all is reported to have been underwritten, and the management and directors are all experienced automobile men, a number having been connected with well known Detroit concerns.—F. J. H.

There is continued activity in the metal line in Detroit and vicinity for this month. Manufacturers and dealers in metals have so far been able to derive satisfactory profits from their outputs and sales but the continued rising cost of materials may cut into their earnings for the year as the proportionate increase in the selling price has not kept pace with the increase in raw material.

An excellent fall trade has started this month with a shortage of certain materials coming more and more into evidence. Brass tubing is one of the articles hardest to purchase and when an order is placed the manufacturers of same will not guarantee delivery at any special time.

The shipbuilding industry has taken on a boom in this section and the large amount of copper and brass that is used in the different fittings is quite an item. Heavy orders have been placed with local concerns for goods used on these ships under construction.

Evidence of expansion are visible on every hand, but many manufacturers with commendable judgment and prudence endeavor to repress demand rather than to encourage it and credits are closely scanned.

The different manufacturers of brass accessories used on automobiles are all fully employed at this time although it is generally their dull period.

The H. Mueller Manufacturing Company, Sarnia, Ont., are just having completed a new main office building at the north end of their property overlooking the St. Clair river. The building is 60 x 60 feet, two stories and basement, and modern in every way. At present the company has several offices in different parts of the plant which, with the new arrangement, will all be placed in the new building. The building will include a board room, executive offices, treasurer's office, purchasing department, auditor's rooms, reference department, and everything that tends towards convenience and efficiency. A dining room for the office staff and departmental heads will also be located in the basement. The present main office will be added to the shipping room by the removal of partitions.—P. W. B.

COLUMBUS, OHIO

NOVEMBER 6, 1916.

The metal market in Columbus and central Ohio territory has ruled firm in every way during the past month. Demand for all varieties has been good, and prices have remained at about the same levels as formerly. There is a fairly good supply of all metals available in this territory, although no special surpluses have developed. The demand is from a large number of metal using concerns, many engaged in the munitions business. The tone of the market has been satisfactory, and prospects for the future are said to be bright.

Some delay in shipments has been caused by the car shortage,

which is affecting all lines of industry alike. Some disturbance in metal circles has been caused by the heavy increase in the price of coal, which may cause a dimunition in the demand for many of the metals.

Copper is selling well and prices are firm. No. 1 scrap copper is selling at 25½ cents to the trade. Brass is also firm, and selling at 19 to 20 cents for No. 1 red, and 16 cents for yellow. Aluminum is rather strong, although prices have not advanced. It is now quoted at 42½ cents for No. 1 scraps and 52½ cents for new scraps. Babbitt is strong, and the same is true of type-metals. Tin is unchanged. Zinc is stronger and selling around 11¼ cents. Other metals are unchanged.

The Simmons Metal Company, of Cleveland, O., has increased its capital stock from $25,000 to $100,000.—J. W. L.

CLEVELAND, OHIO

November 6, 1916.

Employers and higher salaried employes in the metal industrial plants, representing nearly 100 shops in Cleveland, have become enrolled in the Industrial Association, the objects of which are to safeguard and develop industrial justice and prosperity. At the October meeting, J. H. Foster, of the Hydraulic Pressed Steel Company, was toastmaster, and Charles Woodward, efficiency expert, the chief speaker.

The Cleveland Chamber of Commerce has stepped into the controversy between striking molders and foundry heads, with a view toward settlement. The body is trying to effect a meeting between employers and representatives of the molders, as a result of which it is hoped some settlement of the demands for a $4 a day basic rate and a nine-hour day may be reached. Meanwhile molders striking at the plant of the Taylor & Boggis Foundry Company plant have won a point in the refusal of an injunction asked by the company to restrain the strikers from violence and intimidation. Judge Stevens, in refusing the injunction, said he did not see where violence had been committed, but added he would not stand for such action by the men.

As a contrast to this controversy, the Ferro Machine & Foundry Company has opened a store in its plant, where tobacco, lunches, and such things the men may need during the day will be sold at cost price. "We feel this is one way of cutting down the high cost of living for our men," said E. L. Brady, of the firm. "If the plan is successful we will increase the stock of the store."

The Colburn Machine Tool Company, Franklin, Pa., has purchased a five and one-half acre tract in this city, upon which will be erected a plant to take care of the business which has doubled in the past year. The Osborn-Crew Company, manufacturers of metal stampings and specialties, also will be a new metal concern for Cleveland, a plot of ground in the east end having been purchased for a new building to be erected immediately.

The Aluminum Castings Company has started the construction of a new plant wherein will be made the Lynite piston rods for automobile engines. Operations on production are expected to start some time in December. This company has applied for a receiver for the Automatic Signal Appliance Company, manufacturer of traffic signals, claiming a judgment of $553.62, obtained last April, has not been paid.—C. C. C.

CINCINNATI, OHIO

November 6, 1916.

There are two factors very much in evidence as contributing to the strength of the metal market in this vicinity, and, on the other hand, to the difficulties of foundries and other concerns needing supplies. These are the scarcity and high cost of labor and the slowness and shortage of cars. While copper and other metals and the alloys are of course high, and to that extent hard to get, this is not so much a source of worry to the trade in this district as the two factors mentioned, which are interfering to some extent with the activity of business. Aside from this, the situation leaves little to be desired, as demand is still splendid in all quarters, and bids fair to continue indefinitely. A pleasing fact is that the business now being handled is far from centered on war materials and machinery for the manufacture of munitions, being distributed more and more on work of a domestic nature, coupled with the undoubted prosperity which is in evidence. Local machine shops and foundries are working at full capacity, many of them still maintaining extra shifts whenever they can get the men, and as wages are uniformly high, the city's business in the metal trades and allied industries was never better from the standpoint of employees and employers alike.

H. H. Suydam, president of the Cincinnati Manufacturing Company, recently concluded successfully negotiations at Columbus, O., as the result of which his company will take over the metal door department of the Kinnear-Jager Manufacturing Company, of Columbus. The business of that department, it is understood, will be moved entirely to Cincinnati, becoming a part of the business of the Cincinnati Manufacturing Company, and calling for the addition of a number of men and further equipment to the company's forces.

L. D. Whitcomb, for some time one of the force of the Westinghouse Lamp Company at Cincinnati, has resigned in order to become connected with the Monroe Brass & Wire Company, of Cincinnati.

The National Colortype Company, of Newport, Ky., across the river from Cincinnati, which has the contract for furnishing automobile tags for 1917 to the State of Kentucky, recently suffered a loss of $2,000 by a fire which started while a lot of the tags were in process of baking. Thefts of copper and brass still continue, the high price of the metals serving as a temptation to marauders to pick up materials of this class whenever they think they see an opportunity to do so. A couple of brass thieves caught recently coming from the Morris foundry with 200 pounds of brass were compelled by the patrolman to carry the material to the station to serve as evidence of the offense.

The Niles Tool Works, of Hamilton, Ohio, is reported to have completed arrangements for the construction of a new brass foundry at a cost of $30,000, to be used in connection with the plant. The building will be 125 by 75 feet, of brick and concrete. It is to be erected immediately south of the company's main plant.

The Recording & Computing Machine Company, of Dayton, O., is reported to have received additional war orders to the amount of approximately $50,000,000. While much of this business will probably be distributed to other concerns under sub-contracts, the company now has a capacity of 35,000 fuses daily, employing 8,000 men.

The Standard Stamping Company, of Marysville, O., will move its plant from Marysville to Huntington, W. Va., during the coming spring, inducements in the way of a free site and railroad facilities having been offered by the Huntington chamber of commerce.—K. C. C.

LOUISVILLE, KY.

November 6, 1916.

Several of the leading copper working concerns of the Louisville district report that they either have or are expecting some good orders on distillery repair work. In some cases the copper workers now have their forces scattered in various parts of the State getting the plants in readiness to run, although actual operations of the distillers will not start for some weeks yet on account of the high price of grain, coal, etc., and the car shortage, which is making it almost impossible to obtain such commodities. Nearly all of the shops are busy with work of some kind at this time, there being very little work in white metal, zinc, etc., but a good run on copper, brass and bronze goods. Pattern making is light. Local manufacturers in various lines are operating full at the present time, and there is an active demand for various kinds of castings to be used in mechanical contrivances, the demand for elevator parts being especially good.

There was practically no change in prices during the month, the brass, copper, zinc and other markets remaining firm. Sheet copper, base price is 37½c. a pound; base, tubes, 42c.; ingot, 27½c.; scrap copper, 23½c., and scrap brass 12@16c., according to quality and weight. Deliveries from the mills are better than they have been for some months, the sheet mills being able to make shipments within ten days of receiving orders, but much being lost on the road due to lack of cars and freight congestion. The tube mills are still slow, but to regular customers, which are on the preferred list, are making deliveries in from four to six weeks.

While some of the machinery men claim that national polities have affected conditions during the past two or three weeks, and aided in slowing up orders, it is contended by the copper men that such is not the case, and that, with the United States doing a big export business, and filling orders created by war conditions, there is small chance for politics to cut much ice. Supporters of both parties are claiming that things will go to the bow wows if the other party gets in, but while the race is developing much interest, it is claimed by the big operators in several lines that politics are not causing any slump in business.

Hines & Ritchey report that they are running along smoothly with a fair volume of special repair work. Enough work is coming in at the present time to keep the regular shopmen going steadily.

The Standard Sanitary Manufacturing Company, manufacturers of brass plumbing goods, enamel ware, japanned material, etc., and nickel platers, have let contracts for the erection of a $25,000 addition to the Louisville plant, known as the Ahrens & Ott works. The addition will be of fireproof construction and used as a warehouse and for manufacturing.

George H. Holzbog, a manufacturer of New Albany, Ind., who has been making ambulances for the government, in a recent statement said he was being forced to substitute brass at nearly 30 cents a pound in place of malleable iron at eight cents a pound, because of the scarcity of iron and the trouble in obtaining it. Orders placed last February have not been filled in some instances.

The Independent Brass Foundry reports that in spite of the high price of metal the concern is very busy on castings of various kinds, having some large orders for the Abel Elevator Company. The concern has cleaned up all of its government contracts upon which it was busy for several months.—P. V. W. S.

TRENTON, N. J.

NOVEMBER 6, 1916.

Business continues very good in the metal industry line and the winter promises to be a prosperous one. Some mechanics are taking advantage of the good times and scarcity of help and demanding more money and shorter hours. Organized labor has caused considerable trouble at the J. L. Mott plant during the past summer and fall and one strike has followed another. The company has been turning out war munitions for more than a year, and the hands working on the same think they are entitled to more wages. A small strike occurred recently at the plant because a non-union metal polisher refused to join the union. The matter was quickly adjusted. The company had two shifts of molders, working six hours each, and adopted a new plan, making one shift of nine hours. The men had to put in three more hours a day for the same wages and went on a strike. The men are still out, but the plant is not affected to any degree, so far, through the strike. The molders were very far in advance in their work and the munition workers have enough work to last them for some time. When this work is completed the company will need the molders again, and should the strike continue the plant would be seriously affected. The new order of munitions is being turned out slowly. Considerable of the time-fuses were recently spoiled, and this is a big loss to the company. The material will have to be melted up again and the fuses remade. The trouble was due to inferior workmanship. It is reported that the Mott Company is figuring on another big war order, but the officials refuse to discuss the same.

No strikes have been reported among the building trades throughout the State recently, and this is encouraging to the metal industry. A tie-up among labor always affects working conditions in the metal lines.

William G. Wherry, president of the Skillman Hardware Manufacturing Company, reports his business good, and that recent big orders received from the western and southern States shows that there is a demand for the Skillman product. The Ingersoll-Trenton Watch Company is very busy, several of the big orders being for foreign countries. The Bechtel Engraving Company has orders for several big copper and bronze memorial tablets. The company recently disposed of considerable scrap brass, copper and bronze for a good figure.

The Billingham Foundry & Machine Company is buying up considerable scrap brass for several big government orders. The company has extra hands at work and is paying good wages. A strike of some of the molders at the plant of the McFarland Foundry & Machine Company has so far had no effect upon the turning out of bronze and aluminum castings. Other Trenton metal plants enjoying a good fall season are the Trenton Brass & Machine Company, Trenton Smelting & Refining Company, National Electric Plating Works, John A. Roebling's Sons Company, Mercer Automobile Company and the Morris Movshovitz & Son Smelting Works.

The John A. Roebling's Sons Company, Trenton, N. J., has leased the entire five-story and basement warehouse building at 223-227 Arch street for a period of ten years. The company will manufacture lines of its products at the new factory.

Conditions are normal again at the plant of the Standard Fuse Company at Bordentown, where strikes have interfered greatly with the output. The 1,000 employes now appear to be satisfied with their positions and no new labor trouble is threatened at the present time. Recently the employes were given a half-holiday on Saturday, but have to work a little longer during the other part of the week to make up the difference. The men like the new plan better. The majority of them do not live in Bordentown and the half-holiday gives them a chance to get home earlier.

Herbert P. Margerum, president of August M. Crook & Son, Inc., hardware dealers, recently read a paper on "Hardware" before the members of the Rotary Club at the Trenton House. He went into detail and showed the various uses for which hardware are required and how the demand for the same has greatly increased during the past year.

The new ammunition plant at Gibbstown, employing three shifts of men, is turning out various kinds of shells. The plant is turning out about 30,000 a week, and the work is slow, only twelve being placed in a case. The cap and fuse plant at Paulsboro is also busy making war munitions. These shells are shipped abroad, where the cap is placed on them.

The United States Metals Refining Company looks after its employes by selling them potatoes at cost price. It is a regular custom of the company to buy a carload or two of potatoes for its employes.—C. A. L.

NEWARK, N. J.

NOVEMBER 6, 1916.

Neither the Presidential election nor the war appear to check the good business which has been prevailing during the preceding months of the year. Many are the obstacles that have had to be overcome. At almost every turn there has been some perplexing complication. Materials have been constantly advancing in price, it has been almost impossible to get certain things, and often deliveries of goods obtainable are from several weeks to several months late; transportation problems have been perplexing. There have frequently been international complications, which naturally would upset business and call for caution; yet, despite it all, business has gone steadily forward.

Just how healthy and sound business is, is a disputed point. A number have been predicting that conditions would soon change for the worse, that business was on a poor foundation and could not last, etc. In the spring it was predicted that this fall there would be a slump because of the Presidential election. Yet business continues to be good. True, it is not all that is desired, and there are unpleasant features to the situation. Although most manufacturers have raised on the prices of their finished products, the great increase in the cost of materials and of labor has cut into their profits, and they are drawing out of business less than they should for the volume of business transacted. Conditions pictured above, while applying to business in general, are especially true of the metal business. Many manufacturing jewelers report that there has been an increasing demand during late months for a better grade of goods than was being called for a year ago, indicating that money is much freer than it was.

The past summer and early fall have been very satisfactory to the manufacturing jewelers and silversmiths, who have laid their plans for a big Christmas trade. While many retailers have purchased early in order to make sure of getting their goods, and getting them before prices advance still further, many have

delayed placing their orders, and it is probable that during the remaining weeks of this month a large number of orders will be placed. Electro-platers are busy, but a part of their work now consists of household goods to be finished up preparatory for the winter season. There is a continual complaint of the inability to get sufficient help because of the great demands of the munition makers and at present there does not seem to be any relief in sight.—R. B. M.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The Rome Hollow Wire & Tube Company, Rome, N. Y., has awarded the contract for an addition to its plant to cost $25,000.

The Chase Metal Works, Waterbury, Conn., has secured a permit for an addition, 61x140 feet, one story, on Thomaston avenue.

C. Cowles & Company, manufacturers of carriage hardware, New Haven, Conn., has awarded a contract for an addition, 61 x 116 feet, five stories.

A four-story, 100 x 160-foot factory is being erected by the Metal Specialties Manufacturing Company of Chicago, Ill. The estimated cost of the factory is $100,000.

The National Aniline & Chemical Company, New York, N. Y., has established a new office in the south at Charlotte, N. C., to take better care of its increasing southern trade.

The St. Catharines Brass Works, manufacturers of brass, bronze, copper and aluminum castings, St. Catharines, Canada, is extending its plant by a brick addition 50 x 80 feet.

The Jonathan Bartley Crucible Company, Oxford street, Trenton, N. J., will build a new three-story brick addition for the manufacture of crucibles and retorts, to cost about $40,000.

The Clarage Fan Company, manufacturers of heating and ventilating systems, Kalamazoo, Mich., has established a branch office at 123 West Madison street, Chicago, Ill., which will be in charge of L. O. Monroe.

Cleveland Galvanizing Works Company, Cleveland, Ohio, has awarded the contract for a one-story factory to cost $30,000. Besides a galvanizing department this company operates a brass foundry, tinning and plating departments.

Owing to the greatly increased demand for Thwing high resistance multiple record pyrometers, the Thwing Instrument Company have been compelled to seek larger quarters and therefor have moved from 445 North 5th street, to 3339-41 Lancaster avenue, Philadelphia, Pa.

The Aluminum Goods Manufacturing Company, Manitowoc, Wis., is preparing to build a three-story building 50x170 feet on the site of the present two-story shop, immediately upon the completion of work on the new five-story factory, storage, office and warehouse building now under way.

The Stamford Rolling Mills Company, whose sales office is at 25 Broad street, New York, is having additions built to its plants in Springdale and Stamford, Conn. These additions include an office building, another casting shop, storehouse extension and several small buildings to house the recovery plant and other departments.

The Brown's Copper & Brass Rolling Mills, Ltd., New Toronto, Ontario, Canada, is building an addition to its plant which will give its sheet mill a capacity of approximately 2,000,000 pounds, and will be confined solely to the manufacture of brass, bronze and gilding metal in sheets, rolls, coils and plates. The estimate cost of the new addition is $25,000.

The American Bronze Company, Berwyn, Pa., report that the new addition to its plant, which was recently completed, gives them 50 per cent increase in the foundry capacity. This increase has been found necessary, due to the growing business of the company. Besides a bronze foundry, this company operates a bronze machine shop, tool and grinding room.

The Doehler Die Casting Company, Brooklyn, N. Y., announces the removal of its brass-back department from Brooklyn to its Toledo plant. An entire new factory building housing foundry and machine shop, fully equipped with all modern labor-saving devices, is devoted to the exclusive manufacture of the Doehler babbitt-lined brass-back bearings.

President E. Stanley Clark, of the Kathodion Bronze Works, announced recently that the War Department had awarded the Kathodion Bronze Works in an order for 30-calibre cartridges, also for clips and bandoliers for same. The order has been given after the War Department had made a thorough inspection of the Kathodion Bronze Works' plant at Nyack, N. Y.

The Waterbury Brass & Bronze Company, Waterbury, Conn., is erecting a foundry 40 x 104 feet, one-story, on East Main street, adjoining the plant of the Manville Machine Company. This new foundry will enable them to produce eight tons of castings per day and will enable them to make castings weighing up to a ton. The company reports that they are now working on a large government contract.

The City of Philadelphia, acting upon the recommendation of the Franklin Institute, has recently awarded John Scott medals and premiums to John V. N. Dorr, president of the Dorr Cyanide Machine Company, New York, N. Y., for the invention of the Dorr classifier, the Dorr thickener and the Dorr agitator, and to Carl E. Akeley, of the American Museum of Natural History, New York, N. Y., for the invention of the cement-gun.

The Electrical Alloy Company, Morristown, N. J., announces that they manufacture Monel metal in the form of rods, wire and strips. In this connection the company states that Monel metal is a natural, stronger-than-steel, non-corrodible nickel-copper alloy, containing approximately 67 per cent. of nickel; it closely resembles pure nickel in color and is proof against all atmospheric conditions, acid fumes and steam, and under any conditions will be better after years of use than steel, phosphor bronze or similar metals which rust and disintegrate when exposed to salt air and dampness.

The idle plant known as the Supplee Foundry, at Columbia, Pa., recently operated by the Keystone Boiler Works, now at Landisville, Pa., has been purchased by J. A. Constantine, of Columbia, and who will operate it as a brass, bronze and aluminum foundry under the name of the Colonial Foundry and Machine Company. It is intended to start operations at once and orders have already been placed for material. Foundry work of all descriptions will be done, and also a general line of machine work. Mr. Constantine has been associated with the Keystone Boiler & Foundry Works, now at Landisville.

The manager of each branch office of the Haynes Stellite Company, Kokomo, Ind., has supervision over four to eight expert demonstrators, mechanics and sales, men whose province it is to work out mechanical problems, and show where and how Stellite should be used. The branches, of which there are five, carry a complete stock of standard size standard Stellite tools and arc-welded Stellite tools. The managers and the offices of which they are in charge are located as follows: Roe L. Johnson, 120 Broadway, New York; A. F. Young, 900 Lytton Building, Chicago; G. O. Litt, 910 First National Bank Building, Cincinnati; J. T. Plummer, 911 Citizens Building, Cleveland, and J. J. Cruice, 318 Telegraph Building, Detroit.

The Connecticut Brass Company, Waterbury, Conn., has sold its plant at Mixville to John E. Liggett of New York. It is

understood the purchase price was approximately $600,000 and that its products will be absorbed by the corporations with which Mr. Liggett is affiliated. The plant comprises a rolling mill, a casting shop and several other departments and is now running nights, turning out sheet brass. This company has been incorporated under the name of the Connecticut Brass Corporation for $3,000,000 under the laws of Delaware. The following now control the company: John E. Liggett, of the banking house of Liggett-Hichborn & Co.; Russell A. Cowles, vice-president of the Buffalo Brass & Rolling Mills; A. J. Skinner, of the Commercial Trust Company, Springfield, Mass.; George R. Walker, New York, and E. B. Schoemaker, of the Coe Stapley Manufacturing Company, Bridgeport, Conn.

Operations have been begun by the Motor Products Corporation, Detroit, Mich., at the plant recently acquired from the Lozier Motor Company. The corporation is the successor of the Diamond Manufacturing Company, of Detroit, Mich., and Walkerville, Ont., Canada; the Rand Manufacturing Company, the Vanguard Manufacturing Company, the Universal Metal Company, all of Detroit, and the Superior Manufacturing Company, Ann Arbor, Mich. All of the Detroit factories are being combined under one roof, and the Ann Arbor factory will be maintained for special work, while the plant at Walkerville will be enlarged to take care of the Canadian trade. The output of the company includes hub caps, radiator parts, tubing and metal shapes, exhaust tubes and other automobile parts. Special die and stamping work is also done. The company operates a tool and grinding room, and stamping, plating, polishing, soldering and japanning departments. The officers are W. C. Rand, president; C. F. Jensen, vice-president and director of purchases; D. D. Lee, treasurer and general manager; H. H. Seeley, vice-president and sales manager, and M. L. Brown, secretary.

SUPPLY HOUSE ROBBERY

Charles F. L'Hommedieu & Sons Company, makers of platers' and polishers' supplies had an exciting pay day on October 14, 1916, at their office and factory, 4521 Ogden avenue, Chicago, Ill. An automobile was driven up to the factory and two youths alighted. On entering the office they suddenly drew revolvers and covered Arthur L'Hommedieu and the bookkeeper who happened to be in the office at the time. Then they pushed the office people into the vault, but did not lock the door, and helped themselves to the pay roll amounting to $300 and some office records, stepped out into the machine and drove away. When the office people recovered from the surprise attack they made an effort to follow the robbers with another machine but without avail. In the future the L'Hommedieu company will pay employees with checks—not cash.

AMERICAN BRASS COMPANY DIVIDEND

Directors of American Brass Company, Waterbury, Conn., have declared a regular quarterly dividend of 1½%, payable November 15 to stock of record October 31; also an extra dividend of 3½%, payable on same date to stock of same record. Directors have declared further an extra dividend of 5%, payable December 20 to stock of record of November 30. This distribution of 10%, together with 15% paid during three previous quarters, makes a return of 25% for year on $15,000,000 capital stock.

FIRE

The Egyptian Lacquer Manufacturing Company, manufacturers of lacquers for metal goods, New York, N. Y., announce that the published reports regarding the fire which occurred at its plant at Rahway, N. J., on October 13 were exaggerated. The company states that the fire was limited to a small part of the plant, and that the loss was comparatively slight. Repairs which were necessitated by the fire are rapidly being completed.

BUSINESS TROUBLES

Adam W. Smith, who conducts the Nelson Brass & Iron Foundry in New Brunswick, N. J., has filed a petition in bankruptcy in the United States District Court in Trenton, N. J. His liabilities are placed at $1,318.40, while his assets are placed at $130.25. The matter will be heard before a referee in bankruptcy in New Brunswick on November 10.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To Manufacture Brass, Bronze and Aluminum Castings, etc.—The Hamilton Brass, Limited, Hamilton, Ontario, Canada. Capital, $40,000. Incorporators: Herbert S. Less, John M. Telford, Robert P. McBridge and others. The company will operate a brass, bronze and aluminum foundry, brass machine shop, tool room casting shop, spinning, stamping plating, polishing and lacquering departments.

FOREIGN TRADE OPPORTUNITIES

For addresses of these inquiries apply to Bureau of Foreign and Domestic Commerce, Washington, D. C., and give file numbers.

Copper, No. 22576.—A business man in Switzerland requests the Bureau to place him in touch with American copper foundries and refiners in a position to export copper. Exclusive agencies are desired. References.

Graphite, No. 22623.—The Bureau is informed that a business man in the West Indies desires to communicate with importers and others interested in the purchase of graphite, known also as black lead and plumbag.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

Grinding Wheels.—The Star Corundum Wheel Company, Detroit, Mich., have issued catalog No. 9 of the Star grinding wheels. This catalog consists of 100 pages giving illustrations, descriptions and prices of the extensive line of carborundum grinding wheels manufactured by them. There is also included safety code booklet which gives information for the use and care of abrasive wheels. Copies will be sent upon request.

Oxy-Acetylene Equipment.—The Imperial Brass Manufacturing Company, Chicago, Ill., have sent out a small booklet in the interest of their Imperial oxy-acetylene equipment for cutting and welding for all metal industries. The prices of these welding outfits run from $12 to $95, so that any size plant can be equipped at a cost to suit its income. A complete catalog and data on operating costs will be mailed upon request.

Invisible Hinges.—The Soss Manufacturing Company, Brooklyn, N. Y., have issued a little booklet showing the wide application of their invisible hinges. These hinges are made in two styles; blunt and polished and are made so that the working parts are composed of frictionless metal needing no oil and give no noise or wear. All hinges have roller bearings which work as easily as ball bearing butt hinges.

Gears and Pinions.—The General Electric Company, Schenectady, N. Y., have issued Bulletin No. 44,419 which is concerned with railway motor gears and pinions. The catalog gives an interesting series of pictures showing the production of these gears, while the text describes their character, style and manufacture. Several pages are devoted to illustrations of the comparative sizes of gear and pinion teeth.

Insulating System.—The Armstrong Cork & Insulating Company, Pittsburgh, Pa., has issued a 48-page book entitled "Drinking Water Systems," which is considerably more than a trade catalogue. This book describes drinking water systems insulated with Nonpareil cork covering for supplying healthful drinking water to the employees of foundries, mills, factories and other industrial establishments. Copies will be sent upon request.

Sand Riddle.—The E. J. Woodison Company, Detroit, Mich., have issued a folder describing their Champion electric sand riddle for mixing core sand, facing and for general foundry use. It is stated that this riddle has unequaled sand sifting capacity, due to a gyro-reciprocating motion. The riddle is equipped with a ¼ h. p. motor, and is so arranged that it cannot be overloaded. Price and further information regarding this riddle may be had upon request.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REPORT

NEW YORK, Nov. 6, 1916.

COPPER.

The copper market was held very firm during the entire month and prices have gradually advanced about ½ cent per pound. There have been some dull periods when home consumers and foreign consuming orders were slow, but towards the end of the month there has been some good business closed and unless the refinery output is increased as arranged, the large producers will be pushed to take care of the demand and keep up their contract obligations. Outside of a few hundred tons of nearby electrolytic copper of November-December delivery, the market is entirely controlled by the big producers, and for first half of 1917 shipment prices range from 27 to 28 cents. These prices are at the usual delivered terms, cash 30 days or cash less ½ per cent. It is rumored that the Allies are likely to place another large order for second half of 1917, but nothing definite is known about it. Possibly when the proposed new loan to England is arranged, further copper orders may be placed.

The exports for the month will total close to 33,000 tons or over 1,000 tons a day, but this amount does not cover the large foreign buying that was announced some months ago. The trouble seems to be to find freight room. Lake copper is offered at 28½ for November-December Electrolytic for prompt and November is from 28¾ to 29 cents, asked by some holders, and December is held at 28¾ to 29 cents. Casting copper is scarce and limited quantities of November are offered at 27½ cents.

TIN.

The tin market during the month has been quite active and prices have advanced nearly 3 cents per pound, from 39¼ at the opening to 42 cents at the close. Consumers have bought freely and the tin plate makers have covered for their needs for some months ahead.

LEAD.

The lead market was held very firm at 7 cents as the trust price and the independents getting from 5 to 10 points higher on certain business. The market closes at 7 cents trust price, 50 ton lots, New York basis, while the independents asked 7 to 7⅛ cents.

SPELTER.

The spelter market has been fairly active and prices have advanced about 1 cent per pound, from 9½ New York to 10⅜ cents at the close. Sheet zinc is unchanged at 15 cents f. o. b. mill.

ANTIMONY.

The antimony market has been quite active during the month and prices have advanced about 2 cents per pound during the month from 11 cents early in October to around 13 cents at the close. Futures are more freely offered and trading is quieter.

ALUMINUM.

Some export orders in the market caused an advance of 3 or 4 cents during the month when prices reached 66½ cents with sales at that price. At the close the market is easier with spot virgin aluminum offered at 65 cents.

SILVER.

Prices have declined nearly 2 cents per ounce during the month from 69½ at the opening to 67¾ at the close. The demand has not been very active.

QUICKSILVER.

The quicksilver market has been firmer with a good demand and supplies have not come along as freely as usual. Prices have advanced from $75 a flask at the opening to $80 at the close. As the market is today the top price can probably be shaded.

PLATINUM.

The platinum market has held very steady at $80 an ounce during the entire month. This price compared with $87 an ounce last month at $60 an ounce during August.

SHEET METALS.

There has been no change in the nominal market quotations for sheet copper and brass. Special prices being made on individual business. Sheet copper is quoted at 37½ for hot rolled and 38½ for cold rolled. Copper wire is quoted at 33¼ cents for prompt and 32¾ for November shipment. High sheet brass is quoted at 42 to 44 cents per pound base. The rest of the list is the same as last month.

OLD METALS.

The old metal market has held very steady in sympathy with the firmer markets for ingot metals. There has been a good export inquiry for brass and copper scrap and prices today are rather higher than a month ago.

J. J. A.

WATERBURY AVERAGE

The average prices of Lake Copper and Brass Mill Spelter per pound as determined monthly at Waterbury, Conn.:

Lake Copper. 1915—Average for year, 18.94. 1916—January, 24.75. February, 27.75. March, 28. April, 29. May, 29⅞. June, 28.25. July, 27.25. August, 27. September, 28. October, 28⅞.

Brass Mill Spelter. 1915—Average for year, 17.50. 1916—January, 22.25. February, 22.75. March, 23.15. April, 23.20. May, 21.20. June, 17.40. July, 15.20. August, 13.60. September, 13.70. October, 12.95.

OCTOBER MOVEMENTS IN METALS

COPPER.	Highest.	Lowest.	Closing.
Lake	28.50	28.25	28.50
Electrolytic	29.00	28.50	29.00
Casting	27.50	26.50	27.50
TIN	42.75	39.90	41.90
LEAD	7.00	7.00	7.00
SPELTER	10.55	9.50	10.45
ANTIMONY (Chinese and Jap)	13.25	10.90	13.25
SILVER	69⅛	67⅛	68⅛

Metal Prices, November 6, 1916

NEW METALS.	Price per lb. Cents.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Lake, carload lots, nominal	28.50
Electrolytic, carload lots	29.00
Casting, carload lots	27.50
TIN—Duty Free.	
Straits of Malacca, carload lots	41.75
LEAD—Duty Pig, Bars and Old 25%; pipe and sheets 20%. Pig lead, carload lots	7.00
SPELTER—Duty 15%.	
Brass Special	11.50
Prime Western, carload lots, nominal	10.50
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½ per lb.	
Small lots, f. o. b. factory	75.00
100-lb. f. o. b. factory	70.00
Ton lots, f. o. b. factory	66.00
ANTIMONY—Duty 10%.	
Cookson's cask lots, nominal	....
Hallett's cask lots, nominal	....
American	Nominal
Chinese, Japanese	13.25
Wah Chang WCC, brand spot	13.25
NICKEL—Duty Ingot, 10%. Sheet, strip and wire 20% ad valorem.	
Shot, Placquettes, Ingots, Blocks	45.00 to 50.00
ELECTROLYTIC—5 cents per pound extra.	
MANGANESE METAL	Nominal
MAGNESIUM METAL—Duty 25% ad valorem (100 lb. lots)	$4.00
BISMUTH—Duty free	$4.00
CADMIUM—Duty free	nominal $1.80
CHROMIUM METAL—Duty free	.75
COBALT—97% pure	$2.00
QUICKSILVER—Duty, 10% per flask of 75 pounds	$80.00
GOLD—Duty free, per ounce	$20.67
PLATINUM—Duty free, per ounce	$90.00
SILVER—Government assay—Duty free, per ounce	.68⅛

INGOT METALS.	Price per lb. Cents.
Silicon Copper, 10% according to quantity	38 to 40
Silicon Copper, 20% " "	39 to 42
Silicon Copper, 30% guaranteed " "	45 to 49
Phosphor Copper, guaranteed 15% " "	34 to 37
Phosphor Copper, guaranteed 10% " "	33 to 36
Manganese Copper, 30%, 2% Iron " "	48 to 53
Phosphor Tin, guaranteed 5% " "	50 to 52
Phosphor Tin, no guarantee " "	49 to 51
Brass Ingot, Yellow " "	20 to 22
Brass Ingot, Red " "	24 to 26
Bronze Ingot " "	22 to 24
Parsons Manganese Bronze Ingots " "	30½ to 32
Manganese Bronze Castings " "	28 to 37
Manganese Bronze Ingots " "	23 to 27
Phosphor Bronze " "	24 to 26
Casting Aluminum Alloys " "	46 to 49

PHOSPHORUS—Duty free.	
According to quantity	35 to 40

Dealers' Buying Prices. Cents per lb.	OLD METALS.	Dealers' Selling Prices. Cents per lb.
21.75 to 22.25	Heavy Cut Copper	25.00 to 25.50
20.50 to 21.50	Copper Wire	23.00 to 24.50
18.00 to 18.50	Light Copper	21.50 to 22.50
17.00 to 17.50	Heavy Mach. Comp	19.00 to 19.50
12.50 to 13.00	Heavy Brass	14.00 to 15.00
10.00 to 10.25	Light Brass	11.50 to 12.50
13.75 to 14.25	No. 1 Yellow Brass Turnings	14.50 to 15.25
14.25 to 15.00	No. 1 Comp. Turnings	15.00 to 16.00
5.00 to 5.50	Heavy Lead	5.75 to 6.00
6.50 to 7.00	Zinc Scrap	7.00 to 7.75
18.00 to 20.00	Scrap Aluminum Turnings	19.50 to 21.00
30.00 to 31.00	Scrap Aluminum, cast alloyed	32.00 to 34.00
40.00 to 42.00	Scrap Aluminum, sheet (new)	45.00 to 47.00
23.00 to 24.00	No. 1 Pewter	25.00 to 28.00
26.00 to 28.00	Old Nickel	30.00 to 32.00
19.00 to 21.00	Old Nickel anodes	22.00 to 24.00

PRICES OF SHEET COPPER.

Mill shipments (hot rolled) ..... 37½c. base net
From stock ..... 39c. base net

Width.	LENGTH.	64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
	SIZE OF SHEETS.	Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins., but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Not longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 3c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

ZINC— Duty, sheet, 15%.

	Cents per lb.
Carload lots, standard sizes and gauges, at mill	16.00 cent basis, less 8%
Casks, jobbers' prices	18.00
Open casks, jobbers' prices	18.50

Metal Prices, November 6, 1916

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect May 10, 1916.

To customers who buy over 5,000 lbs. per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.40	$0.41	$0.42
Wire	.40	.41	.42
Rod	.40	.42	.43
Brazed tubing	.45	—	.47
Open seam tubing	.45	—	.47
Angles and channels	.45	—	.47

To customers who buy 5,000 lbs. or less per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.42	$0.43	$0.44
Wire	.42	.43	.44
Rod	.42	.44	.45
Brazed tubing	.47	—	.49
Open seam tubing	.47	—	.49
Angles and channels	.47	—	.49

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuations in the price of zinc.—Ed.]

BARE COPPER WIRE—CARLOAD LOTS.

31½c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	38c.	per lb. base
100 lbs. to 300 lbs. in one order	38½c.	" " "
Less than 100 lbs. in one order	40c.	" " "

PRICES FOR SEAMLESS BRASS AND COPPER TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, — per lb.
Seamless Copper Tubing, — per lb.

For other sizes see Manufacturers' List.

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe sizes with price per pound.

⅛ ¼ ⅜ ½ ¾ 1 1¼ 1½ 2 2½ 3 3½ 4 4½ 5 6

Due to fluctuations of the metal market we are unable to quote these prices.

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet	
	Brass.	Bronze.
⅜ inch		
½ inch		
⅝ inch		
¾ inch		
⅞ inch		
1 inch		
1⅛ inch		
1¼ inch		
1½ inch		
1¾ inch		
2 inch		

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	42c.	net base
Muntz or Yellow Metal Sheathing (14" x 48")	38c.	" "
Muntz or Yellow Metal Rectangular sheets other than sheathing	43c.	" "
Muntz or Yellow Metal Rod	39½c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 58c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more 5c. over Pig Tin. 50 to 100 lbs. 6c. over, 25 to 50 lbs. 8c. over, less than 25 lbs. 10c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 7c. over Pig Tin. 50 to 100 lbs. 8c. over, 25 to 50 lbs. 9c. over, less than 25 lbs. 15c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Base price, 60c.

Gauge.	Width. Inches.	1 ton.	50 to 2,000 lbs.	Less than 50 lbs.
20 and heavier	3-30			
	3-30			
21 to 24 inclusive	30-48			
	48-60			
25 to 26	3-30			
	30-48			
27	3-30			
	30-48			
28	3-30			
	30-48			
29	3-30			
	30-48			
30	3-30			

We are unable to quote these prices, but they can be had upon application to manufacturers and dealers.

The above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. No charge for boxing. F. O. B. Mill.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.

Outside Diameters.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 in.	2½ in.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.																	
12.	.109.																	
14.	.083.																	
16.	.065.																	
18.	.049.																	
20.	.035.																	
21.	.032.																	
22.	.028.																	
24.	.022.																	

We are unable to quote these prices, but they can be had on application to manufacturers and dealers.

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

We are unable to quote these prices.

BASE PRICE GRADE "B" GERMAN SILVER SHEET METAL.

Quality.	Net per lb.	Quality.	Net per lb.
5%	44c.	16%	48c.
8%	45½c.	18%	48½c.
10%	46c.	20%	51c.
12%	47c.	25%	60c.
15%	47½c.	30%	66c.

GERMAN SILVER WIRE.

Quality	Net per lb.	Quality.	Net per lb.
5%	47c.	15%	53¾c.
8%	49c.	16%	54¼c.
10%	50½c.	18%	56¼c.
12%	52¼c.	30%	71½c.

The above Base Prices are subject to additions for extras as per lists printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are considerably higher.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 1c. below to 4c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.